



ST. LOUIS AND THE WORLD'S FAIR.

Articles in our issues of September 23, October 28 and November 11 gave some impressions of the Louisiana Purchase Exposition, ending with notes on the passenger cars. It remains to mention the freight cars, the electric cars and what may be called some unconscious exhibits—that is, those features of railroading in St. Louis outside the World's Fair, which one sees in going to the fair and which are of interest either to native or to foreigner. These last are chiefly at the Union Station. The two throats to the yard (plan published in the *Railroad Gazette*, March 20, 1903, p. 212) appear to make a very satisfactory arrangement—assuming that it is desirable to have a single station 600 ft. wide. The yard and its approaches make one of the two largest stations in the country; and as far as train movements are concerned it may perhaps be considered a larger yard than Boston for the reason that in the Boston station the trains of the Plymouth and Midland divisions can be kept entirely separate from those that run to the Back Bay, thus making two stations practically independent of each other. This is not true, or not so fully true, at St. Louis.

All through trains, and nearly or quite all local trains are invariably backed into the St. Louis station. This makes it possible to have the notices of prospective train arrivals, five minutes in advance, all sent to the offices in the station from one point, the signal cabin at the junction of the shed-track throats with the main line. The use of the telautograph for giving these notices was described in our issue of September 16, page 335. And backing the trains in is a good thing for the baggage department, as baggage cars both incoming and outgoing stop always at the same place, near the baggage storage rooms; but to the passenger it seems as though the multiplication of five minutes by the number of passengers arriving at the station in a year must foot up an enormous number of hours wasted. The freight-car passenger specials, run by the Wabash, between the station and the Fair grounds are run into the station head first. These trains, by the way, do not make very fast time. The moderate speed (which includes some slackenings on account of junctions or other yard conditions), with the unpleasant features of freight-car riding, seems to be sufficient to lead a good many passengers to take the street cars instead. These are more frequent, though they consume a good deal more time for the through journey; and as they are well managed and, for many passengers, start at places more convenient than the Union station train shed, they take the bulk of the business. Our friends from Europe will not see the best of tracks on these street lines, but in other respects will see probably as good an example of city "trolley" transportation as can be found outside of Massachusetts.

The reason that the baggage-room space at the Union station is nearly all at the outer end of the shed is that it is so exten-

sive that there is no room for it elsewhere. It is beneath the tracks, with wagon ways approaching from both sides. The checking room—in the usual place, not far from the concourse—is connected with the large underground room by pneumatic tubes, so that claim checks and records of individual trunks are whisked back and forth with no appreciable delay. Every piece delivered at the underground room by a teamster or hackman for an outgoing train is weighed, and its weight entered on its card-check record so that excess-baggage disputes are done away with. Six or eight men in the checking room keep records of all baggage, so classified by check numbers, that the owner and his baggage are always quickly connected when required. In the month of August the number of pieces of baggage handled was 268,044, about double the number in that month last year.* Brass checks are now used for only a small fraction of the baggage sent from this station.

The main floor of the Union station, above the track-level floor, has always been unpopular because, as long as there was room in the lower story, passengers preferred to stay there because of its ease of access and nearness to trains; but this summer the upper room has been used from necessity. Two stairways were put in leading down to the concourse about 30 ft. out—the top landing being a bridge of that length—thus relieving the interior stairways of what must otherwise have been an intolerable crush.

The "pay toilets," put in this year, are of two grades, five-cent and ten-cent. The most obvious comment on these is that ten cents does not buy any more at some stations than five cents does at some others.

But to return to the World's Fair. The electric cars are noticeable chiefly by the details which indicate that they have been designed to afford comfort and facilities for comparatively long journeys, as distinguished from a city street car, which to a considerable share of its passengers is quite tolerable if it affords standing room and protection from wind.† One car, for the San Francisco & San Jose, has a row of

*The car movements and the baggage movement at the Union Station for October were as follows, the total number of cars that month being 3,579 more than the total for the month before (September):

| | Oct. '04. | Oct. '03. |
|-------------------------------|-----------|-----------|
| Passenger cars in and out.... | 77,731 | 37,241 |
| Baggage handled, pieces..... | 300,959 | 141,584 |

The number of train and engine movements recorded at the signal tower for 24 hours from 4:00 p. m. July 14th to 4:00 p. m. July 15th, was 2,203, divided as follows:

| | |
|--|-----|
| Loaded passenger trains | 740 |
| Empty coach sets to storage yard | 396 |
| Light engines, including switch and road engines | 792 |
| Switching movements | 185 |
| Freight movements | 87 |

From 7:00 to 8:00 p. m. there were 158 moves, the heaviest during 24 hours. From 8:00 to 9:00 a. m., 139 moves; and from 8:00 to 9:00 a. m. there were 56 loaded passenger trains handled in 60 minutes.

†The most prominent novelty among the electric cars is a private car for the President of the Milwaukee Electric Railway & Lighting Co. This car has all the luxury and elegance of the ordinary private car, and, in fact, might be a copy of a standard railroad officers' car, except in size. This car was built by the St. Louis Car Company, which shows a half-dozen others, including one with a steel frame in which parts are left unfinished so as to give a good idea of the different processes in making the frame and the different stages of the painting. One of the cars is for the Northwestern Elevated of Chicago, and one, with copper siding, is for the Interborough Rapid Transit Company of New York. The J. G. Brill Company shows a convertible car, to be made open in summer and closed in winter; and another semi-convertible. The American Car Company and the John Stephenson Company show one car each. These cars are heavy and strong, and designed for high speed. The last-mentioned has six-wheel trucks and journals, 5 in. x 9 in.

electric lights along each side of the clear story, providing good reading light in every seat. The seats, as in all the interurban cars, are transverse, which has become the settled practice; although no one has yet, we believe, been bold enough to build a trolley car of the width necessary to make such seats entirely comfortable for two persons.

The two cars shown by the American Car & Foundry Company and the John Stephenson Company are the most ambitious imitators of steam railroad cars, in the matter of strength and large size. The Master Car Builders' type of coupler, seen on one of them, evidently must be adopted generally, sooner or later, if freight cars are to be taken to and from steam railroads. These two cars are so massive and well built that they could withstand a sizable butting collision. This reminds one of the question, still unanswered, and which must have occurred to many railroad men, whether our electric roads are going to safeguard their passengers by steel car-frames or by the better plan of not having collisions. In attractive designs and decoration, and in minor conveniences as far as possible, they have imitated steam railroad practice with much good judgment; but in the art of keeping trains from running into one another most of the interurban lines are about where the steam roads were sixty or seventy years ago.

Freight cars are not conspicuous at the fair. Doubtless they were deemed too prosaic for the purpose aimed at in filling up the long tracks of the Transportation building—to make a show that would attract the multitude. Therefore we have a half dozen cars which may be called specialties or advertisements, and that is all. These are all well-known to our readers.*

The experimental electric locomotive for the New York Central, which is described elsewhere in this issue, marks a distinct advance in electric motive power, for it embodies a number of features never before applied. The first impression of the casual observer in looking over the machine is the closeness with which the best practice in steam locomotive design has been followed. In the general arrangement of the cab fixtures, in the frame, in the use of radial pony trucks, there is a striking similarity. One important object of the designers was to improve on the starting power and riding qualities of the steam engine without attempting to eclipse it in maximum speed. The Marienfelde-Zossen electric traction tests aimed only at the attainment of enormously high speed; this locomotive has been designed for a reasonably high rate of speed for continued runs, but its salient feature is its large starting effort and quick acceleration. Any difference in running time between the new and the old mode of traction will be attained by increasing the acceleration and not by increasing the maximum speeds on long runs. The best feature of multiple-unit traction is the quick starting power of the whole train, and in so far

*The American Refrigerator Transit Company exhibits a refrigerator car built at its own shops, and the American Car & Foundry Company a refrigerator car for fruit. The Schwarzschild & Sulzberger Company has a long car filled with samples used by its travelling salesmen. A salesman takes a car of this kind from city to city, inviting prospective customers to visit the car at the railroad station. There is a Bettendorf cylindrical tank car of 10,000 gallons capacity; a Rodger ballast car and a Hart convertible flat car.

as it is possible, this locomotive is intended to equal the accelerations obtained with the multiple-unit system. It is designed for 32,000 lbs. maximum drawbar pull; and in the tests conducted last week successfully demonstrated its high power in starting a nine-car train easily and quickly with no jerking, or slipping of the drivers. The curves of speed, current and voltage accompanying the description show the uniform acceleration obtained; and the diagram, Fig. 2, shows the remarkable efficiency of the machine through all ranges of speed. No steam locomotive yet built can approach this machine in that respect.

Victorian Railways.

For the first time in 15 years the railroads of Victoria, Australia, show this year a surplus of gross income over operating expenses and interest on State loans; and this showing is more remarkable because of the excessive deficit of \$1,471,815 in 1902-03. The report for the year ending June 30, 1904, just received, shows a surplus of \$2,500 over and above all charges, and in many other details indicates a strong and apparently successful effort on the part of the Railway Commissioners to operate the lines on a paying basis. It will be remembered that early in 1903 Mr. Thomas Tait, then Manager of Transportation on the Canadian Pacific, was appointed Chairman of the Victorian Railway Commissioners, a position carrying with it control of the operation of all of the railroads in the colony, which aggregate 3,381 miles. While the success of the first year's operation under Mr. Tait's management is not, of course, to be wholly attributed to methods which he has introduced, he is undoubtedly entitled to a large share of the credit as a personal achievement.

The operating conditions in Victoria are in many respects quite similar to those on American railroads. There are the same long stretches of single-track road carrying light traffic, both freight and passenger, heavy grain crops to be moved within a short time, and, in and around Melbourne, a fairly large suburban and industrial traffic to be served. The gage of lines owned by the Government is 5 ft. 3 in., with the exception of about 80 miles of 2-ft. 6-in. gage line, but the narrow gage lines are more than usually well adapted to heavy rolling stock. Naturally, the first work of the incoming Chairman and his associates was to make an inventory of the equipment and an inspection of the condition of the lines, and to follow this with a comprehensive scheme for an immediate reduction in expenses. Fifteen years of inefficient management had left the lines with extraordinary liabilities amounting to \$3,851,483 in the shape of deferred repairs and renewals. With this discouraging prospect Mr. Tait set earnestly to work to apply his more progressive methods. During the first six months of the year the gross income was the smallest for five years, but during the last half, owing largely to an exceptionally heavy grain movement, following fine harvests, the gross income was the largest ever obtained, and for the whole year amounted to \$16,640,602, being \$340,237 more than for any previous year. At the same time operating expenses were reduced to 52.6 per cent. of gross receipts, the lowest since 1879, notwithstanding that the expenditures for maintenance of way and rolling stock were larger than in any of the preceding three years. A general increase of nearly 25 per cent. in the cost of fuel and supplies also worked against a reduction in operating expenses. The total ordinary working

expenses for the year just closed were \$8,753,943 as against \$8,885,998, a decrease of \$132,055. Net earnings, less amounts deducted for repayments and belated repairs, were \$7,336,765, or 3.84 per cent. on the indebtedness of the railroads, the largest per cent. since 1899.

The report in dealing with traffic volume and density, reduces all statistics to a comparative basis of train-miles and hence the ton-mileage increase does not show. Including live stock, 3,439,203 tons of freight were carried with 2,887,917 train miles. This is an increase of 5,576 tons over the largest previous year's tonnage (1901-02) and a decrease of 1,380,274 train miles, showing the decided increases in train load accomplished. This was chiefly brought about by the methods introduced to load engines and cars up to their full capacity and preventing as far as possible the unnecessary movement of empty cars. Twenty new engines, four passenger cars and 200 steel freight trucks of 12 and 15 tons capacity were put into service during the year.

The Italian Ministry, which had till next June to decide whether it would renew contracts with corporations for working the railroads of the country (which are state property), or have them worked directly by the State, has at last decided for State operation, a plan for which was submitted a few months ago, in case this decision should be taken. The railroads at present are worked by three great companies, organized for the purpose, on contracts which were terminable June 30, 1905, on three years notice from either party. Both parties gave the requisite notice, and an investigation was made as to the best policy to pursue, the ministry apparently inclining to a new contract with the operating companies, if a favorable one could be secured. The decision in favor of direct operation by the State is therefore somewhat unexpected, the more so because it was part of the program of the party opposed to the Ministry, which has just been defeated at the elections for Parliament. The Ministry evidently had difficulty in deciding, and announces that it believes that "on the whole" the change will be advantageous. The operation by the companies has been bitterly complained of; the public has been dissatisfied; the employees have fairly revolted; the State has received substantially no direct return on its immense investment, and the companies, we see, were unwilling to continue under the old contracts. The fact is that it is extremely difficult to work the Italian railroads satisfactorily, the conformation of the country, the nature of its products, and the economic condition of the people all making the transportation problem different from that of the countries further north. With this change the railroads of the continent of Europe east of France become to an overwhelming extent State systems, a large part of the Austrian and less than a third of the Russian lines being worked by corporations, and some others which make but a small part of the total mileage.

Major J. G. Pangborn, Chief of the Baltimore & Ohio Railroad Company's great historical exhibit in the Transportation building at the World's Fair, is doing what he can to interest railroad companies in the establishment of a permanent railroad museum, of which this exhibit would form the nucleus. We understand that he has already communicated with a number of companies and has met with a fair degree of success. It is understood that the city of Philadelphia has offered the use of an existing structure which Major Pangborn thinks admirably adapted to meet the requirements of

the project. When these locomotives and models were exhibited at Chicago they occupied 30,000 sq. ft. At St. Louis the exhibit occupies 60,000 sq. ft.; and the building now offered at Philadelphia affords a clear floor space of 120,000 sq. ft. This building has track facilities and power connections, is well lighted and is in a central location near the Schuylkill river. It is hoped that the leading railroads and allied interests will assure the maintenance of an exhibit in this building until an endowment can be secured and permanent arrangements made. The completion of an exhibit at Philadelphia before next May, when the International Railway Congress will meet in Washington is, of course, much to be desired. Nowhere in the world, except on paper, is there such a rich collection of historical material concerning locomotives and tracks as this one, not even in Kensington museum; and its preservation and adequate care may almost be called a public duty.

Union Pacific.

The rehabilitation of the Union Pacific to its present condition of extraordinary prosperity is one of the most brilliant achievements in the railroad world. Less than eight years ago the Union Pacific was contemptuously referred to as two streaks of rust. To-day it is one of the very strongest roads on the continent.

Last year the company earned 10.4 per cent. on its common stock; this year it earned 10.6 per cent. This year, therefore, it was able to set aside \$3,500,000 for betterments and extraordinary expense as against \$1,500,000 last year. The average mileage operated decreased 410 miles, or 7.11 per cent. This was due to the sale to the San Pedro, Los Angeles & Salt Lake Railroad, of certain lines which would naturally form part of that new system. This road, the San Pedro, Los Angeles & Salt Lake, is under construction from Salt Lake City to Los Angeles. The Union Pacific has taken a one-half interest in the enterprise. The entire mileage turned over to the new company was 512 miles, 17 locomotives, 13 passenger cars and 209 freight cars going with it. The balance sheet shows that the Union Pacific realized on this sale something over \$7,000,000.

Extensive new construction work was in progress during the year. The completed new mileage aggregates 271 miles. The betterments were continued on a large scale. Considerable additions were made to the equipment. The number of locomotives was increased by 32 and the freight cars by nearly 1,000. The road does not pay for its new equipment by car trusts. The report covers the operation of the Union Pacific, Oregon Short Line and the Oregon Railroad & Navigation Company, a total of 5,137 miles of road.

The balance sheet is as follows:

| | | |
|--|---------------|---------------|
| Cost of road and equip. | \$353,788,807 | |
| Stocks and bonds | 139,927,571 | |
| Trust funds | 236,673 | |
| | | \$493,953,049 |
| Current assets— | | |
| Agents and conductors | \$562,526 | |
| Cash | 3,524,257 | |
| Individuals and companies | 1,686,801 | |
| Material and supplies | 4,245,932 | |
| Traffic balances | 350,898 | |
| U. S. government transfer | 805,905 | |
| Loans to Southern Pacific | 20,460,927 | |
| Bills receivable | 884,655 | |
| | | \$32,521,905 |
| Deferred assets— | | |
| Advances for construction and acquisition of new lines | \$4,357,276 | |
| Payments for S. P., L. A. & S. L. | 14,960,000 | |
| Ocean steamships | 5,055,310 | |
| Rolling stock | 3,181,227 | |
| Due from proprietary cos | 331,222 | |
| | | \$27,885,036 |
| Land and town lots | 2,352,651 | |
| | | \$556,712,644 |

| | |
|---------------------------------|----------------------|
| Liabilities— | |
| Common stock | \$108,770,900 |
| Preferred stock | 99,558,900 |
| Auxiliary companies stock | 44,871 |
| Funded debt | 279,741,500 |
| | \$488,116,170 |
| Current liabilities— | |
| Floating debt | \$23,128,000 |
| Sundry accrued charges | 11,922,562 |
| | \$35,050,562 |
| Deferred liabilities | 1,589,837 |
| Reserve funds | 5,950,391 |
| Profit and loss | 26,005,681 |
| | \$556,712,644 |

We have given the balance sheet in full because Union Pacific's credit has been freely used in financing the needs of Southern Pacific, and Pacific Mail and the Los Angeles road. Union Pacific now has a floating debt of \$23,000,000 if we include the \$10,000,000 of short term notes due in February, 1905.

The financing during the year was as below:

| | |
|------------------------------|---------------------|
| Debit: | |
| Decrease of assets— | |
| Cost of road | \$5,780,981 |
| Contingent assets | 964,708 |
| Increase of liabilities— | |
| Preferred stock | 7,000 |
| Funded debt | 469,500 |
| Notes | 10,000,000 |
| Deferred liabilities | 622,642 |
| Contingent liabilities | 1,515,089 |
| Profit and loss | 4,873,442 |
| | \$24,233,362 |
| Credit: | |
| Increase of assets— | |
| Stocks and bonds | \$31,355 |
| Trust funds | 112,447 |
| Current assets | 7,096,542 |
| Deferred assets | 15,829,244 |
| Current liabilities | 1,163,774 |
| | \$24,233,362 |

In short by notes and by increasing the funded debt the company raised \$15,000,000



Union Pacific, Oregon Short Line and Oregon Railroad & Navigation Co.

The lines west of Ogden and south of Portland are not treated of in the report.
The line south of Salt Lake City has been sold to the San Pedro, Los Angeles & Salt Lake.

from the sale of lines to the Los Angeles road \$6,000,000 more, and from surplus nearly \$5,000,000. Some \$16,000,000 went into deferred assets, of which nearly the whole amount was to the Los Angeles road and \$7,000,000 went into current assets, most of which represents advances to Southern Pacific and about \$1,500,000 being cash.

The entire capital and betterment expenditures for the year were a little over \$4,000,000. But if we add the amounts advanced to other companies and spent by them, we have a total of such expenditures of about \$20,000,000.

The betterment work was largely change of line, reduction of grade, ballasting and replacement of wooden bridges with steel. About three miles of such bridge work was done. The income account was:

| | | |
|-----------------------------|--------------|--------------|
| | 1904. | 1903. |
| Gross earnings | \$55,279,230 | \$51,075,188 |
| Expenses and taxes | 30,497,442 | 28,747,215 |
| Net earnings | \$24,781,788 | \$22,327,972 |
| Other income | 4,266,843 | 4,625,121 |
| All income | \$29,048,631 | \$26,953,094 |
| Charges | 12,451,539 | 11,676,452 |
| Surplus | \$16,597,092 | \$15,276,642 |
| Dividends | 8,333,636 | 8,333,168 |
| Balance | \$8,263,456 | \$6,943,474 |
| Special appropriation | 3,550,000 | 2,000,000 |
| Balance | \$4,713,456 | \$4,943,474 |

Gross earnings increased about 8 per cent., while expenses increased but 6 per cent. The decrease in "other income" was due to suspension of dividends by the Northern Securities Co. by order of the court. But because of the interest on the heavy advances made during the year to subsidiary lines the loss to "other income" from suspended dividends was nearly all made good. The increase of gross earnings was made up of an increase of \$1,000,000 in passenger and \$4,000,000 in freight. Both the passenger and freight business increased about 10 per cent. There was practically no change in the average ton-mile receipt.

The showing made in expenses is very reassuring. With \$5,000,000 increase in gross earnings there was but \$457,000 increase in conducting transportation expense. This amounted to an increase of but 3.4 per cent. Maintenance was most liberal as indicated by the next table:

| | | |
|--|--------------|--------------|
| | 1904. | 1903. |
| Total maintenance | \$12,608,792 | \$11,032,769 |
| Maintenance: | | |
| Of way per mile of main and second track | 1,192 | 941 |
| Of locomotives, per loco. | 3,565 | 3,590 |
| Of pass. trn. cars, pr car | 813 | 728 |
| Frt. train cars, per car | 75 | 70 |
| Miles new 80-lb. steel rails | 220 | 195 |
| Total number cross-ties | 2,300,000 | 1,707,000 |
| Same reduced to trk-miles | 851 | 608 |

The train load this year reached 451 tons as compared with 412 last year, and 288 in 1898. The year has been one of vigorous growth, the enormous expenditures for betterments having reached fruition in the cheaper cost of transportation. Transportation and general expense together are only about 28 per cent. of gross earnings. This is a showing that few if any roads have equalled this year. The road is pushing the use of its credit rather far to furnish funds for the overhauling of the Southern Pacific,

The government does not even attempt this. Moreover, such a compilation is hardly to be considered as within the functions of a government office, because of the necessity for the exercise of much discretion on the part of the editor in omitting, condensing and explaining; and in this he must feel at liberty to exercise a pretty free judgment. On the one hand he must leave out a great mass of material which would overload his book, while on the other hand he must take care to give his readers the essential facts which they are looking for. Poor's not only keeps up its reputation of a quarter century as the best example of wise condensation and compact statement, but shows improvements year by year. The principal totals and averages from the present issue were given in the *Railroad Gazette* of Nov. 4, p. 528.

Cements, Mortars and Concretes. By Myron S. Falk, Instructor in Civil Engineering, Columbia University. New York: M. C. Clark. 1904. Cloth, 170 pages. Price \$2.50.

This book treats only of the physical properties of cement and cement mixtures, with particular reference to those properties which most concern engineering calculations. Much of the data is compiled from outside sources, but where the necessary data has been missing the author in many cases has supplied data of his own based upon tests made for that particular purpose. The scope of the work can be divided into four general headings: physical properties, elastic properties, flexural properties and shearing resistance. One of the most interesting and timely sections is that which treats of the effect of freezing on cement mixtures. The author quotes the results of a number of tests, and in summing up the experiments says that no damage results if the concrete is frozen once only and then thawed out. An appendix to the work contains the report of uniform tests of cement by the special committee of the American Society of Civil Engineers. In addition to this, one chapter is devoted to a brief description of the ordinary commercial tests to which cement is usually subjected.

TRADE CATALOGUES.

The Allis-Chalmers Company, Milwaukee, Wis., is distributing an illustrated booklet bearing the title, "The Powers of the Subway." It gives some interesting comparisons of the power in the subway as compared to other great power equipments. A description of the Allis-Chalmers engines used in the subway power plant is given. There are nine of these, each having a capacity of 12,000 h.p. Interior views of the subway, the subway station, the cars and an illustration of the viaduct at 129th street are also shown.

The American Blower Company, Detroit, Mich., has issued Sectional Catalogue No. 166, relating to dry kilns for timber products. It states briefly the theory of lumber drying and then describes in detail the "A B C" moist-air dry kiln and method of operation; the "A B C" blower dry kiln; "A B C" hot-blast apparatus; and "A B C" apartment moist air kilns. Dry kiln appurtenances are also described and illustrated and a large number of views are shown of installations of "A B C" kilns.

The Watson-Stillman Co., New York, sends a folder descriptive of a new liquid for use in hydraulic jacks. It is called "Jackohol," and it is claimed that it is an anti-freezing,

NEW PUBLICATIONS.

Poor's Manual of Railroads. Thirty-seventh Annual Number. Poor's Railroad Manual Company, 68 William street, New York.

This indispensable hand-book is so well known to our readers that we need make no further announcement than to say that the volume for the present year is now ready. As everybody knows, it is the only available handy and complete history of the railroads of the United States, Canada and Mexico, and in addition it has a great mass of information about street railroads and industrial corporations. Like the statistics published by the Interstate Commerce Commission, it always seems a long time coming, but no one has yet found any practicable way of more quickly compiling such a mass of detailed information and doing it with the necessary accuracy. Unlike the government statistics, Poor's gives a great mass of details, concerning each important road.

non-corrosive and lubricating compound, which will not thicken in freezing weather or cause the valves to clog. It is about 50 per cent. cheaper than the standard formula, which is generally used, and the company guarantee that by its use the cost of jack maintenance will be reduced.

The Ingersoll-Sergeant Drill Company, New York, sends a pamphlet bearing the title, "Driving the New York Subway." It contains some interesting data and illustrations in regard to the subway in general. This is followed by descriptions and illustrations of work done in the subway by the Ingersoll-Sergeant tools and machines, as well as of machines which are now in use, such as ticket cancellers, air compressors, etc.

The Otto Gas Engine Works, Chicago, issues Bulletin No. 1, relative to "useful uses of gasoline." The applications described and illustrated include high-pressure sand-blasting, pneumatic tool cars for field work, railroad draw-bridges, air compressor plants and locomotive turn-tables. The book also shows a view of a 12-in. Otto stand-pipe with flexible spout. The bulletin is a 15-page pamphlet with good, clear engravings and printing.

Joseph Dixon Crucible Company, Jersey City, is distributing its November issue of "Graphite." It contains a number of interesting articles on lubrication, including hints on the care of Corliss valves. The company also sends a pamphlet with the title "Graphite for the Motor," which describes the benefits derived from the use of lubricating graphite on motors, together with descriptions of various graphite lubricants made by the company.

The Edward Hines Lumber Company, Chicago, is distributing copies of XXth Century Interest Tables. These tables are computed for ten different rates ranging from 2 to 7 per cent., and show the interest on any amount from \$1 to \$10,000. It is divided into five sections, and gives a greater variety of tables than most compilations of this kind. Section 5 contains a short compilation of condensed business laws.

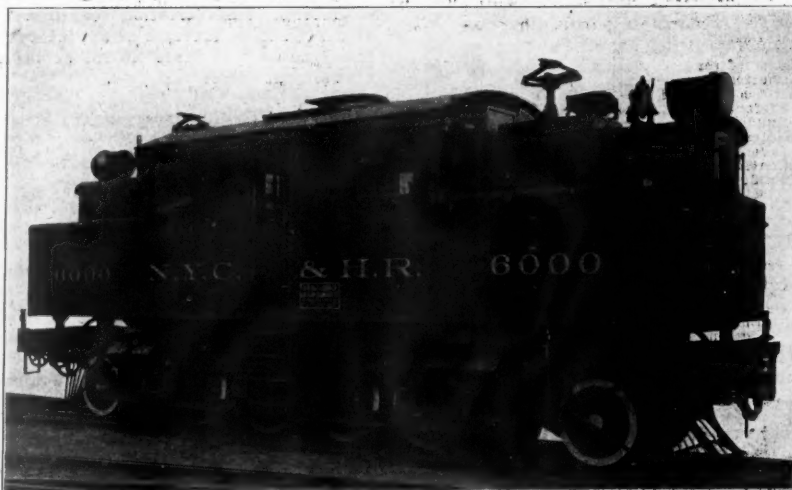
The Lehigh Valley Railroad Company issues a map of New York City, which shows all street car, elevated railroad and subway lines. It also gives complete information in reference to the location of hotels, theatres, etc.

Test of the New York Central Electric Locomotive.

The first official test of the experimental electric locomotive built by the General Electric Company and the American Locomotive Company for the New York Central was held on the four-mile stretch of experimental track which has been equipped with third-rail at Hoffman's Ferry, three miles west of Schenectady on the main line, on Saturday, November 12. A party of distinguished and representative railroad officers and engineers from all parts of the United States were present as the guests of Mr. W. J. Wilgus, Fifth Vice-President of the New York Central, and several runs were made in the

the *Railroad Gazette* from time to time since their first inception, and it is not necessary now to more than briefly touch upon some of the essential features of the operation of its trains by electricity as they have been developed within the last year.

In the *Railroad Gazette*, June 3, of this year, a preliminary description of the electric locomotives to be used for hauling the through trains between Grand Central Station and Croton, 34 miles out on the Hudson division, and White Plains, 24 miles out on the Harlem division, was given. The experimental locomotive, as built, conforms closely to the weights and sizes given in this preliminary description, but in its general appearance and the arrangement of ap-



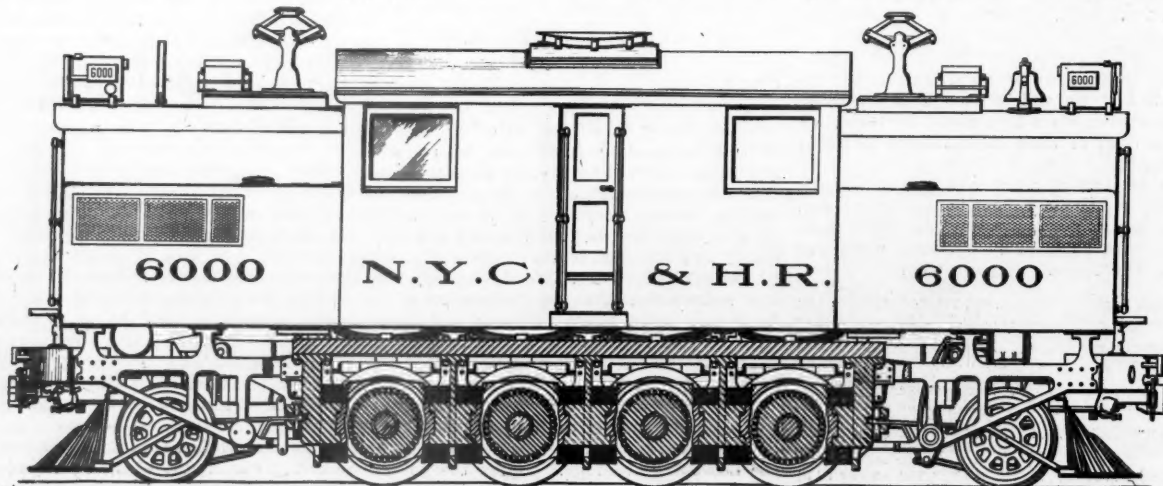
Electric Locomotive Ready for Test.

morning with the electric locomotive hauling trains of from three to nine cars. In the afternoon some further tests were made for the benefit of a number of representatives of the technical press who were present as guests of the American Locomotive Company and of the General Electric Company.

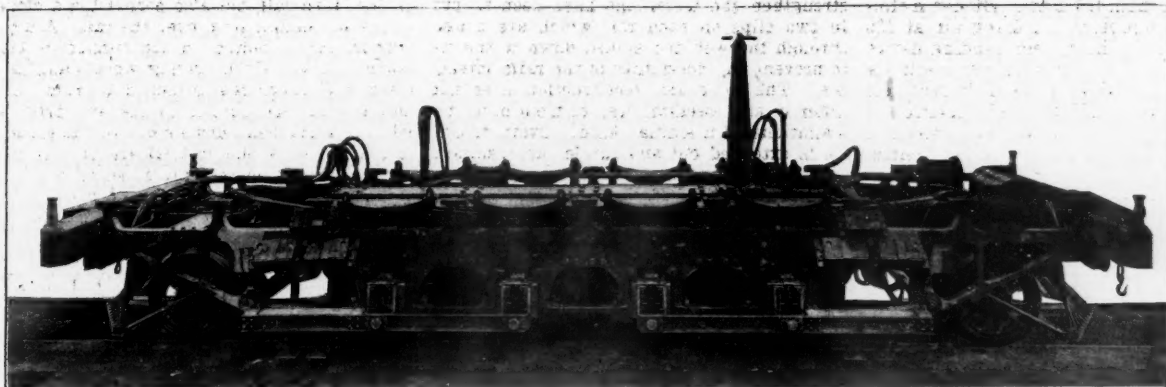
The occasion marks a new era in the development of transportation facilities in this country. Although the Baltimore & Ohio has for a number of years been hauling its trains through the tunnel at Baltimore with electric locomotives the New York Central's electrification scheme is the first radical change on the part of an existing steam road to electric operation for comparatively long distances. The plans of the New York Central have been briefly described in

paratus there have been a number of decided changes. The principal dimensions and data of the completed locomotive are given again here. From 30 to 50 of these locomotives will be required for hauling the company's through passenger trains. These trains vary in weight from 250 tons to 875 tons and the schedule calls for maximum speeds of from 60 to 70 miles an hour. For trains exceeding 450 tons in weight, two or more of these locomotives can be coupled together and operated from the cab of the leading locomotive as a single unit, since they are equipped with the Sprague-General Electric system of multiple unit control.

The distinguishing features of the design in which it differs from all other electric locomotives previously built are the absence of all gearing and a complete system of



Side Elevation of Electric Locomotive and Longitudinal Section through Motors.



Frame and Motors of Electric Locomotive Assembled.

spring suspension and equalization throughout all of the driving and truck wheels. The armatures are mounted directly upon the axles and the field poles are integral parts of the frame. Other gearless electric locomotives have been built, but in these the armatures have been mounted on quills and supported with a spring suspension from the driving axles; these complications are dis-

missed bars to the underframe of the main truck and the inner ends of these radius bars are connected to the equalizing system on each side. The equalizing system is cross-connected so as to equalize the load under all conditions and to furnish at least three points of support necessary for perfect equilibrium. The frame of the locomotive immediately over the pony trucks is supported by means of suitable links, so that the trucks are free to swing about their centers and are self-centering on straight track.

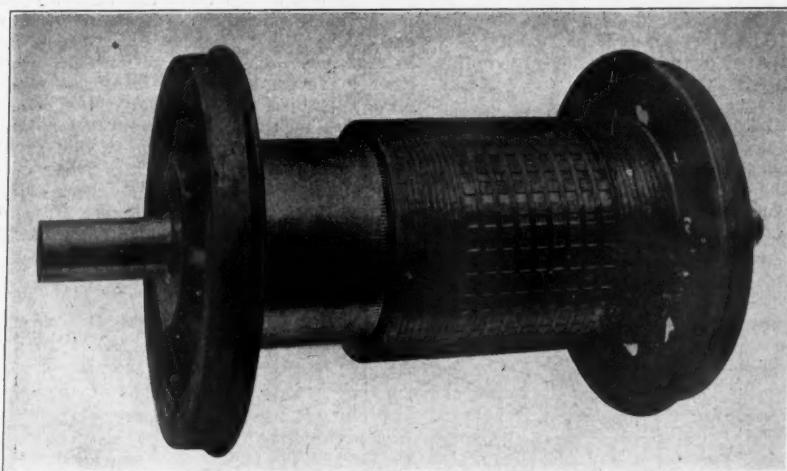
The superstructure of the locomotive is clearly shown in one of the accompanying illustrations. It is entirely separate from the frame and is supported on the frame by lugs cast on the top bar. It is made of

sheet steel throughout and contains all of the auxiliary electric and control apparatus, air compressor, sander boxes, etc. A rectangular cab over the center of the locomotive is built out to the maximum clearances both as to width and height. The control apparatus, air-brake valves and whistle cords are arranged in duplicate at diagonally opposite corners of the cab, so that the locomotive may be run in either direction without turning. A seat for the motorman is provided along the side of the cab in the corner, and convenient to his left-hand is the handle of the controller. This moves in the arc of a circle very similar to the throttle handle on a steam locomotive, and, in fact, the entire arrangement of apparatus is

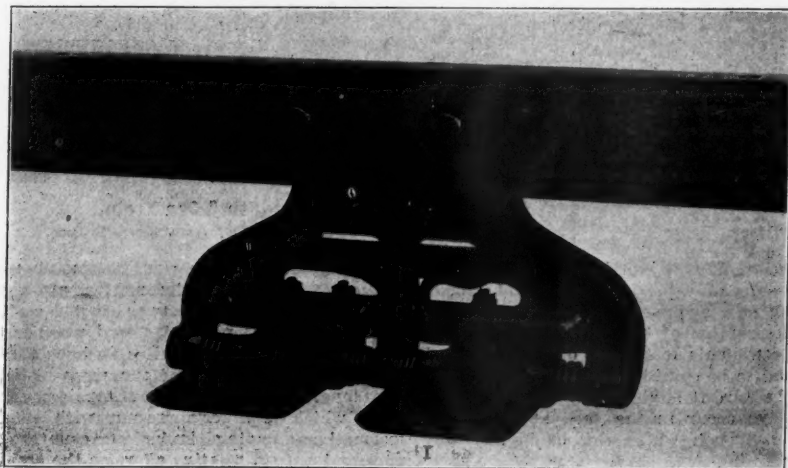
PRINCIPAL DIMENSIONS OF ELECTRIC LOCOMOTIVE.

| | |
|---|--------|
| Number of driving wheels..... | 8 |
| Number of pony trucks..... | 2 |
| Total weight of locomotive, tons..... | 95 |
| Weight on drivers, tons..... | 69 |
| Rigid wheel base, ft..... | 13 |
| Total wheel base, ft..... | 27 |
| Diameter of driving wheels, ins..... | 44 |
| Nominal horse-power rating..... | 2,200 |
| Maximum horse-power rating..... | 3,000 |
| Maximum starting drawbar pull, lbs..... | 32,000 |
| Voltage of current supplied..... | 600 |
| Maximum full load current, amp..... | 4,300 |
| Number of motors..... | 4 |
| Rating of each motor, h. p..... | 550 |
| Number of third-rail shoes..... | 4 |
| Number of overhead collectors..... | 2 |

pensed with in this design. When repairs are required to the wheels or motor the axle and its armature can be dropped from between the poles in the same way as an ordinary pair of wheels. Because of the high speeds required it was essential that a perfect system of equalized spring resistance should be introduced between the wheels and frame of the locomotive. All of the four pairs of driving wheels are equalized by suspending the main frame and the superstructure from a system of half-elliptic springs and equalizing levers connected together over the tops of the pedestals. The pony trucks at each end are of the radial type similar to the standard construction used for steam locomotives on the New York Central. These are pivoted by means of ra-



Motor Armature and Driving Wheels.



Third-Rail Collector Shoe.

very similar to that now in use, with the exception of the entire absence of the heavy and cumbersome reversing lever and quadrant. A small reversing handle on the controller box controls the direction of movement. The brake valve is mounted on the end wall of the cab and the whistle cord is within easy reach. A push button for operating the sanding device is also mounted on the side wall. Above the motorman's head on the end wall are mounted the direct reading ammeters and volt-meters, which are an essential part of the equipment. A central aisle runs through the entire cab and superstructure so that the locomotive may be entered from either end, and doors in the sides are also provided.

The control apparatus, including the contactors, resistance and reversing switches, is mounted in the space at each end of the superstructure on either side of the central aisle. The resistance is placed next to the floor, which is open to provide for ample ventilation and cooling, and the other ap-

paratus is mounted above it. In the middle of the cab is mounted a two-cylinder motor-driven air compressor supplying air at 130 lbs. for the air-brake system, sanding device and whistle. This operates automatically and keeps the pressure in the main reservoir at all times above 120 lbs. The interior of the cab is painted green and the exterior is painted the standard New York Central colors of black and aluminum.

The experimental track which the General Electric Company has equipped west of

and the only additional precautions taken to strengthen the fastenings have been to put in two clips on each rail which are bolted through the web and spiked down to the tie to prevent any possibility of the rails spreading. The third rail construction does not differ in any essential respect from other installations of a similar kind. Every fourth tie is extended out and carries an insulated support of the usual inverted cup type. The standard position of the third rail is 55½ in. out from the center line of the track

and 3½ in. above the top of the track rail. There are a number of grade road crossings on the experimental stretch and at these points an overhead construction has been employed which will be experimented with in order to determine if it will be a satisfactory method of overcoming the difficulties of using the third rail at complicated switches and crossings in the yard. This consists of an inverted strip of tee iron supported from side poles with hangers, and this strip overlaps the broken ends of the third rail on each side of the crossing. The locomotive is provided with

sign intended to be used with a top contact on the third rail, but also permitting a close fitting protecting strip over the rail. A supporting bar is bolted on the outside of the journal boxes of the driving wheels and the third rail shoes are attached to this bar, one at each end outside of the end driving wheels. Each shoe consists of two flat plates, free to move in the vertical arc of a circle, but held down on the rail by spiral springs wound on the pivot shafts. The main leads from the shoes run up outside of the frames

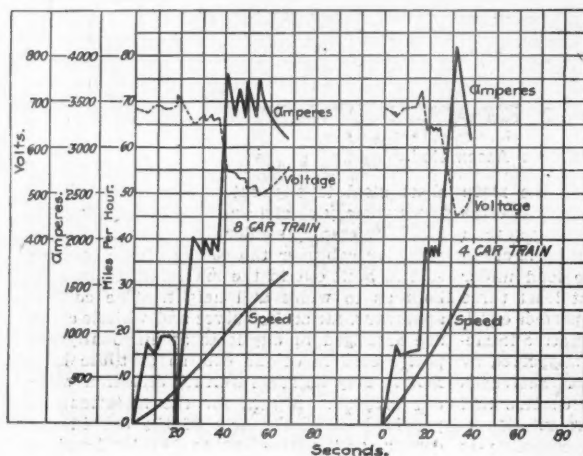


Fig. 1—Starting Test with 4-Car and 8-Car Trains.

Schenectady is at present four miles long, and an additional two miles is now under construction. The stretch selected is the northernmost of the four tracks of the main line at this point and it is practically level, with only two or three curves of large radius, so that it is suitable in every way for making the experiments which are to be conducted there this winter. The General Electric Company has built and installed a complete sub-station transformer equipment at about the center of the stretch of track and alternating current at 11,000 volts and 25 cycles is supplied from a Curtis turbo-gen-

tors, one at each end, and these are operated by a pneumatic valve. A trip near the end of the third rail throws open the pneumatic valve as the locomotive passes and the overhead contactors are thrown up so that they come in contact with the overhead conductor before the third rail shoes leave the third rail. Similarly, the collector shoes pick up the current before the overhead contacts are broken, so that there is no sparking or break in the power current supply. At a number of places along the line short stretches of different kinds of third-rail protection have been built and

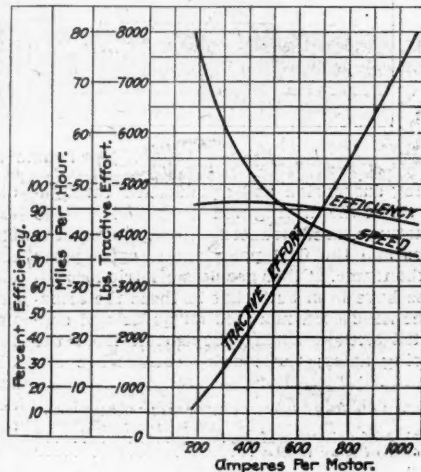


Fig. 2—Characteristic Curves for One Motor.

to fuse boxes located outside of and just below the floor of the cab. These fuse boxes are open at one end and their position is such that in case the fuse burns out the flame blows down and away from the cab. Similar fuse boxes are provided for each of the overhead collector shoes and the fuses supplied to these boxes are intended to be the weakest point in the electric apparatus. They are easily accessible and there is no danger in case one of them blows out.

In the tests conducted on Saturday the

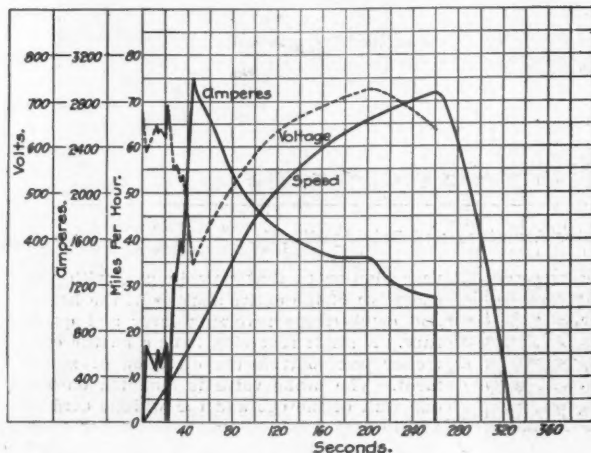


Fig. 3—Speed Run with 4-Car Train.

Weight of train, 170 tons. Weight of locomotive, 95 tons.

erator, installed at the company's works at Schenectady. In the sub-station is a rotary converter, normally rated at 1,500 k.w., but capable of carrying 100 per cent. overload for some time. The alternating current is stepped down through oil transformers from 11,000 volts to 400 volts and delivered to the third rail from the rotary converter at 660 volts. No attempt has been made to build a special track for the experiments. The existing track, which is 85-lb. rail laid on gravel ballast, has been bonded at the joints

other methods will be tried during the winter to determine the best method of protection not only against accidents to employees but interruption of the service due to snow and sleet. This feature is one of the most essential to be considered in the preliminary tests, because it is absolutely necessary that no delays occur in the yard at the Grand Central Station which can be in any way avoided.

The third rail shoe, shown in one of the accompanying illustrations, is of special de-

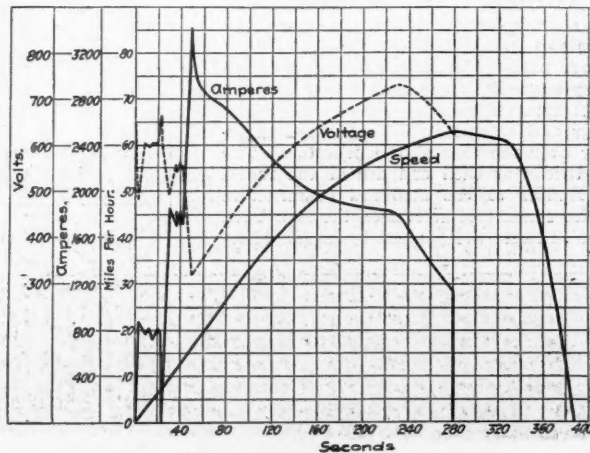


Fig. 4—Speed Run with 8-Car Train.

Weight of train, 336 tons. Weight of locomotive, 95 tons.

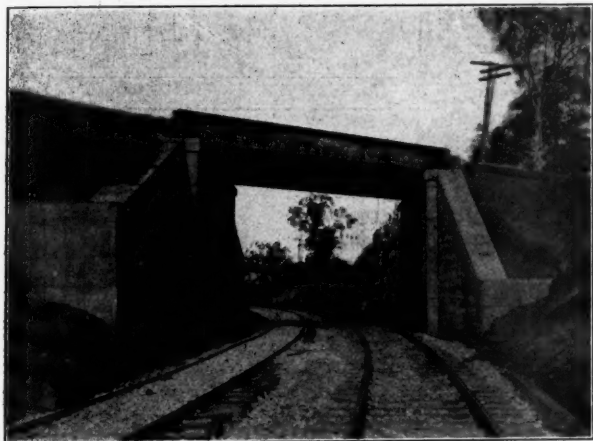
most noticeable feature was the smooth riding qualities of the locomotive at high speeds. A nine-car train was started easily and without perceptible jar, and when running at speeds up to 60 miles an hour there was an entire absence of the nosing effect and longitudinal vibration throughout the train which is always present with steam locomotives having imperfect counterbalance and uneven rotative effort on the crank. The locomotive itself rode as smoothly as a heavy passenger car, and with the excep-

tion of the slight surging which takes place when the controller is moved from the series to the series-parallel position there was no jerking or slipping of the drivers. The rapid acceleration which was possible was also very noticeable. The engine has been designed to accelerate from rest to 30 miles an hour in $37\frac{1}{2}$ seconds, or .8 of a mile when pulling a four-car train weighing 265 tons including the locomotive. This rate of acceleration will, it is expected, be improved upon as the locomotive passes the experimental stage. While the locomotive has

One problem which had to be taken into consideration in designing the locomotive was the heating of trains after the steam locomotives had been cut off. It is expected that sufficient heat will generally be retained in the trains delivered to the electric locomotives at the end of the steam run to carry the cars to the terminal without supplying additional heat. In order to meet contingencies, however, it is probable that a flash boiler of the automobile type will be installed in the operator's cab. This will occupy only a small amount of space, and as

Tidewater Terminal of the Western Maryland at Baltimore.

The recent completion of the Western Maryland Tidewater Railroad at Baltimore is another step in the plans of the Gould interests to secure a seaboard outlet for the Wabash System. For many years the freight and passenger service of the Western Maryland has been reached over the tracks of the Union Railroad, which is controlled by the Pennsylvania. Over \$100,000 a year is paid for this service, so that the new tide-



Bridge under Main Line of Baltimore & Ohio.



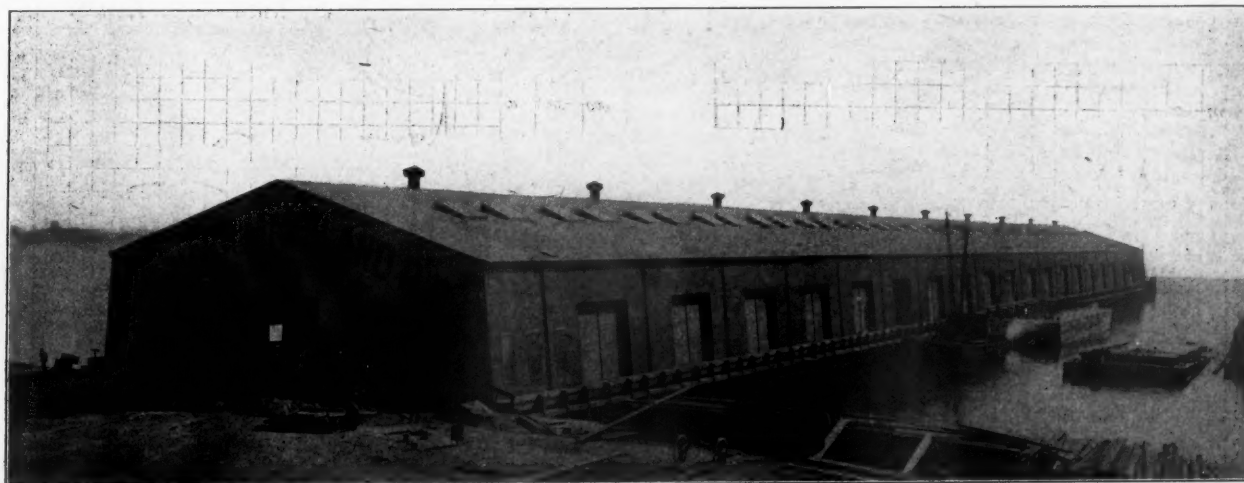
Draw-Bridge over Patapsco River.

been designed primarily to handle heavy trains at speeds of from 60 to 70 miles an hour and light trains at higher rates, the object has not been to obtain a locomotive that can reach abnormally high speeds for short stretches at infrequent intervals, but rather to obtain a high average speed without heating and to have sufficient power to accelerate with great rapidity. For the test of November 12 a special train, made up of seven cars weighing 478.5 tons, includ-

liquid fuel can be supplied there will be no dirt and but little extra weight to be carried.

Before any more locomotives of this type are turned out, the experimental machine now ready will be subjected to every conceivable test to develop any defects of design, and should such defects show up the remainder of the locomotives included in the order originally placed will be modified to meet the new conditions encountered. There has probably never been such an extensive

water line will not only save a large part of this expense, but will open up the present line of the Western Maryland to tidewater shipments. The work, which was begun in November, 1902, included the building of an extension from the main line of the Western Maryland at a point near Walbrook to tidewater, a distance of about six miles, and the erection of large coal and freight piers along the river. The only part of the work remaining unfinished is the terminal yard



New Freight Pier of Western Maryland Tidewater Railroad at Port Covington, Maryland.

ing the locomotive, was hauled at speeds exceeding 60 miles an hour, and even higher speeds were attained with a light train of three cars. The spectacular feature of the tests occurred when the locomotive with three cars behind it was started in a race with the fast mail No. 3 hauled by one of the company's standard Atlantic type engines. The electric locomotive drew away with a fine burst of speed and was more than half a mile ahead at the end of the four miles.

series of tests arranged and the New York Central is certain to have complete knowledge of the possibilities of its new mode of hauling trains before it is ready to put its electrification scheme into actual operation.

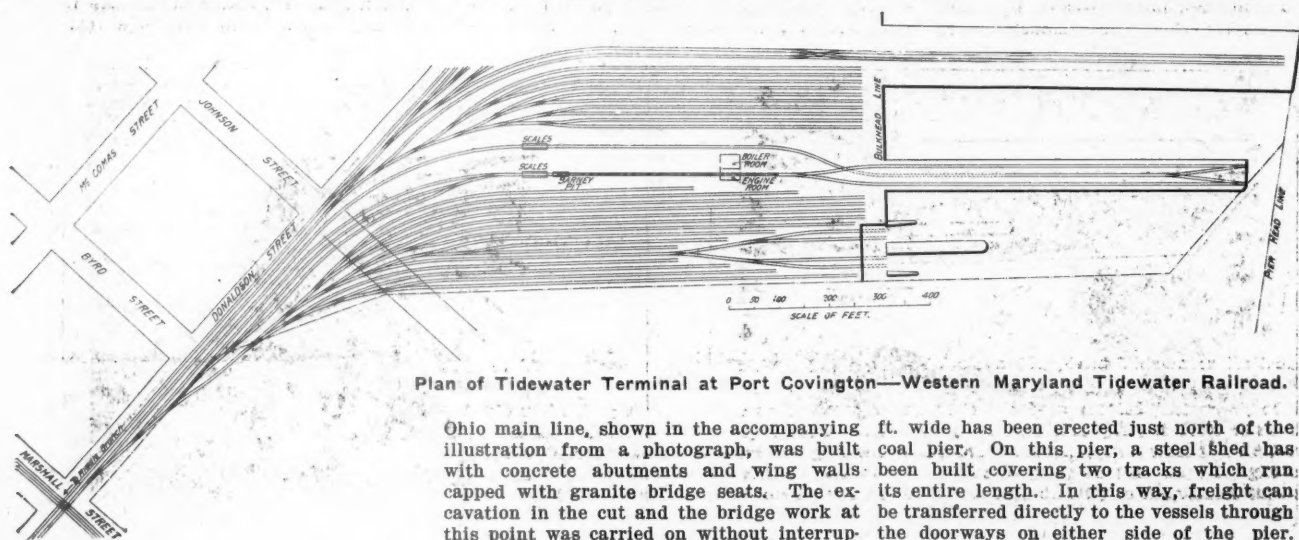
The first section of the Bagdad Railroad, 124 miles long, from Konia to Bugurles, was opened Oct. 25. This is an extension of an old railroad from the Bosphorus opposite Constantinople southeastward 464 miles to Konia.

at the water front where grading and track laying are still in progress. The new line runs along the western and southern borders of Baltimore through the Gwynns Falls valley to Port Covington, on Winans Cove, Patapsco river. It crosses under the Philadelphia, Baltimore & Washington, the main line of the Baltimore & Ohio, and several highway bridges, and crosses the South Baltimore branch of the Baltimore & Ohio at grade near Westport. A manual interlocking plant will be installed at this crossing.

Gwynns Falls is crossed twice, the first time by a 95-ft. steel girder bridge supported on concrete abutments, and the second time by a two-span girder bridge, each span being 55 ft. long. The line also crosses the Patapsco river on a draw-bridge and long trestle approach at a point where the river is nearly half a mile wide. The draw span over the channel is nearly in the center of the river and the trestle approaches are each

ting at various points. The deepest cut was at a point near the House of Refuge, where solid rock was encountered. The cut at this point was 40 ft. deep and about 500 ft. long and necessitated the removal of a large amount of rock, clay and sand. The line is rock ballasted throughout, laid with 85-lb. rails and is double track, except two places where the second track has not yet been laid. The crossing under the Baltimore &

ity down to the yard. Two track scales, one for loaded cars and the other for empty cars, are placed just beyond the "barney" pit, so that the cars can be weighed without delay. A concrete and masonry engine house containing the hoisting engine has been built directly under the incline, as shown in the accompanying drawing. This arrangement saves a large amount of space. An export freight pier 850 ft. long and 120



Plan of Tidewater Terminal at Port Covington—Western Maryland Tidewater Railroad.

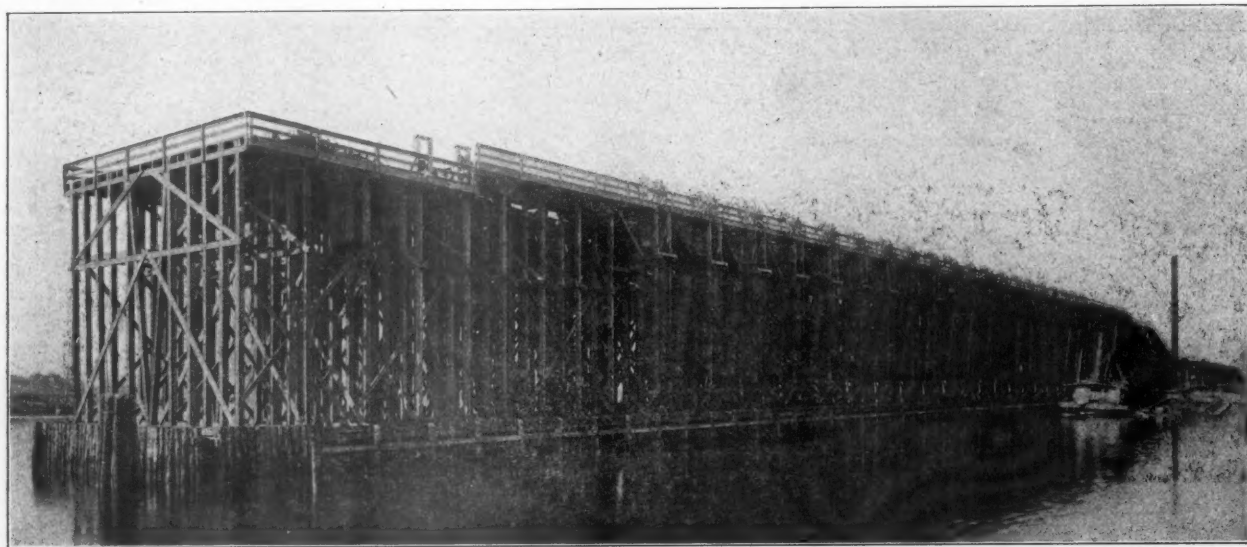
about 1,000 ft. long. There are also four short deck plate girder approach spans each 55 ft. long resting on six concrete piers built on pile foundations. The draw span is 225 ft. long with a clear channel 85 ft. wide on each side of the center pier and fender. The center pier is concrete 30 ft. in diameter, resting on piles driven in the mud bottom 60 ft. below mean low water. After the piles were driven they were cut off 27 ft. below low water with a circular saw on the end

Ohio main line, shown in the accompanying illustration from a photograph, was built with concrete abutments and wing walls capped with granite bridge seats. The excavation in the cut and the bridge work at this point was carried on without interruption to the main line traffic of the Baltimore & Ohio.

At the new terminal at Port Covington, a large coal handling pier 750 ft. long and 60 ft. wide has been built. This pier is equipped with 20 coal chutes on each side, into which the cars will discharge the coal directly to the holds of the vessels lying alongside. The tracks on top of the pier are 70 ft. above mean low water. There are two outbound and two inbound tracks, the latter being in the middle. Loaded cars are hauled up the

ft. wide has been erected just north of the coal pier. On this pier, a steel shed has been built covering two tracks which run its entire length. In this way, freight can be transferred directly to the vessels through the doorways on either side of the pier. There are 20 of these doorways on each side closed by steel rolling doors, and vessels lying alongside can be loaded through any number of hatches at the same time. Two transfer bridges have recently been completed at the extreme south side of the yard, as shown in the accompanying drawing.

When work on the terminal yard was begun, it was found necessary to build a bulkhead along the entire water front by driving six rows of piles. These piles were cut off at low water and a crib of 12-in. tim-



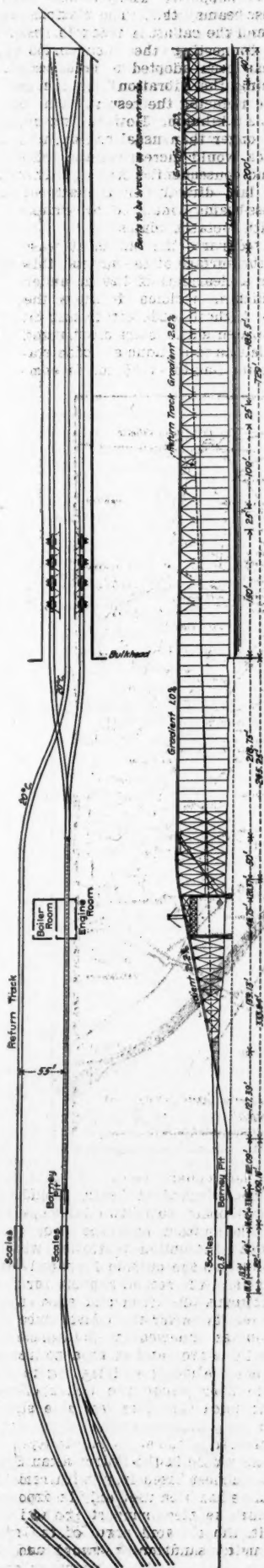
New Coal Pier of Western Maryland Tidewater Railroad at Port Covington, Maryland.

of a 40 ft. shaft mounted in the ways of a pile driver. A circular open caisson with a grillage floor 3 ft. thick was built and floated over the foundation. It was sunk to the tops of the piles and the concrete placed in open air. The steel work of the bridge was built and erected by the Pennsylvania Steel Co. and its total weight is about 730 tons, the swing span alone weighing about 500 tons.

The extension involved some heavy cut-

incline on the inshore end by a "barney," power being supplied by a hoisting engine placed directly under the incline. It is estimated that the cars can be carried up this incline and unloaded at the average rate of one a minute. At the extreme end of the pier are two turntables which will be used to transfer the cars as soon as they are emptied, from the outbound tracks to the inbound tracks, where they will run by grav-

bers was built up to an elevation of 8 ft. above mean low water. Earth filling was dumped in behind the bulkhead to make an even grade in the yard. An area of about 16 acres was purchased for the terminal yard at the water front. This yard contains about 25 tracks not including the main line tracks leading to the coal and freight piers and to the transfer bridges. The river at Port Covington along the shore was originally from



Plan and Elevation of New Coal Pier at Port Covington—Western Maryland Tidewater Railroad.

8 to 15 ft. deep. This has been dredged to 30 ft., so that the largest vessels may now approach the piers. In addition, the company has also dredged a channel 30 ft. deep to the new channel in the middle of the river, recently opened by the government. This work involved the removal of about 1,000,000 cu. yds. of material. All the grading and masonry was done by the Degnon Contracting Co., of New York.

The work has been carried on under the supervision of the Consulting Engineer, Mr. Virgil G. Bogue, Mr. J. W. Galbreath, Principal Assistant Engineer of the Western Maryland, having immediate charge under Chief Engineer J. Q. Barlow. Most of the plans for bridges and piers were made by Mr. A. W. Buel.

Paris Metropolitan Subway Lines.*

By L. BIETTE, Chief Engineer.

The Municipal Metropolitan Railway of Paris is to be double-tracked with a standard gage of 1.44 m.; the width of the cars is to be 2.40 m.; a clearance of 0.50 m. is to be provided between passing cars, and a clearance of 0.70 m. is required between cars and side walls, or parapets, at a height of at least 2 m. above the rails. The franchise was granted to the Compagnie Générale de Traction for a period of 35 years. This company was reorganized as a corporation whose only purpose should be the operation of the Metropolitan Railway, and by a State decree of April 19, 1899, was called the "Compagnie du Chemin de Fer Metropolitan de Paris."

The City of Paris takes charge of all structural work, that is all tunneling, excavations and viaducts necessary to complete the roadbed and to restore the streets utilized for the work to their former condition. In addition to this the city must construct the passenger platforms in the stations, but not the passageways giving access to them. All other expense, such as constructing tracks and electric transmission lines, plants and power stations, as well as purchasing the necessary sites, providing the stairways or elevators for the stations, and the rolling-stock, etc., is borne by the company to whom the franchise was granted.

The rates are 0.15 franc for a second-class and 0.25 franc for a first class ticket from one point on the railroad to another. A part of the gross earnings belongs to the City of Paris in the ratio of 0.05 franc for each second class and 0.10 franc for each first-class ticket; this amount will increase by 0.001 franc for each 10,000,000 passengers till it reaches 0.055 and 0.105 franc, respectively, per ticket, in proportion as the number of passengers will increase at the same rate from 140,000,000 to 190,000,000 per year.

The eight lines laid out have a total length of about 77 km., exclusive of the spurs connecting them, and form three distinct systems. The first three lines form a system 42 km. long, the next three form a second system 20.7 km. long and the last two, a third system 14.5 km. in length. The first system must be completed in eight years at the most, this limit expiring March 30, 1906; the second and third systems must be completed ten years later. Consequently the entire Metropolitan System must be completed by March 30, 1916; at the latest, and it is now certain that this time will be considerably shortened.

The Metropolitan will be elevated for 10.45 per cent. of the total length of the Circular Line and the line from the Cours Vincennes to the Place d'Italie. All other lines will be underground. The maximum grade will be 4 per cent. The normal minimum curve will have a radius of 75 m. decreased occasion-

ally to 50 m., but to as great an extent as possible the radius will be at least 100 m.

The lines already opened to traffic have been successful beyond all expectations. For instance, on Line No. 1 from the Porte de Vincennes to the Porte Maillot the number of passengers carried was:

52,096,285 in 1901;
63,021,067 in 1902;
67,993,147 in 1903.

The number of passengers reported per kilometer for this same line was: 4,925,752 in 1901; 5,958,700 in 1902, and 6,428,816 in 1903. This increase in traffic is greater than any increase obtained elsewhere to date.

The engineers in charge of the survey of the Paris Metropolitan System adopted a plan which may be defined by the following characteristics: absolutely no-metallic tubings, except in crossing the bed of the Seine; adoption of a double-tracked masonry tunnel running as near the surface as possible. The advantages of this plan are: Doing away with the metallic casings effects an important economy in construction; the adoption of a single double-tracked tunnel facilitates operation; the track, being near the surface, affords easier access to the stations, lessens the inconvenience and expense caused by the use of elevators, and the danger to adjacent buildings during construction and inconvenience during operation.

Objections to the surface plan adopted in Paris may be raised on the ground that it requires altering underground conduits, sewers, water and gas mains, electric cables, etc., which are very numerous in the subsoil of the metropolitan highways. This objection cannot be denied, but it has always been possible to replace these conduits without serious trouble, and the expense incurred, although very heavy, is nothing compared to the increase in cost which the tube would have caused to no purpose; this cost, in any case, has no weight if the advantages of the adopted plan are considered.

The standard section of the double-tracked subway is formed by an elliptical arch having a width of 7.10 m. and a rise of 2.07 m. supported by two side walls, 2.91 m. high, finished inside by circular arcs; the section is completed by an invert having a rise of 0.22 m. The total inside height of the tunnel, consequently, is 5.20 m.; the rail is 4.50 m. from the intrados at the keystone, and 0.70 m. above the bottom of the invert. At the rail level the width is 6.60 m., and the thickness of the arch at the keystone is 0.55 m., at the side walls, 0.75 m. The invert, limited below by a horizontal surface, is 0.50 m. thick at the center. This cross-section is feasible only where the distance between the rail and the surface of the ground is not less than 6 m. Where it has not been possible to comply with this condition, a metallic roof, supported by masonry walls, has been built, so that there is always a minimum clearance of 3.50 m. above the rails.

The parts of the tunnels connecting the different lines are built with single track. The arch roof is 4.30 m. wide and rests on side walls 2.62 m. high; the surface of the floor is slightly curved with a rise of 0.075 m. The total inside height, consequently, is 4.695 m. at the axis, the rail being 4.00 m. from the intrados at the keystone and 0.695 m. above the floor. The thickness of the arch at the keystone is 0.50 m., the side walls, 0.60 m., and the floor, 0.55 m. at the lowest point.

On curves having a radius of less than 100 m. for a double track or 50 m. for a single track, the sections specified above would not be wide enough to give the clearance required by law between the cars and the side walls; in such places the width of the tunnel has been adequately increased. Where

*Extracts from a paper presented to Section C of the International Engineering Congress, St. Louis, Oct. 5, 1904.

The metal-roofed stations are 13.50 m.

In the elevated parts of the system, the tracks are supported by a metal viaduct formed by a series of separate bents of variable lengths, composed of two side beams supporting the floor system on their lower flanges. These bents are supported on cast-iron columns wherever it has seemed consistent with the strength of the works; where it has been necessary, on account of stable

In the elevated parts the rail is at least 0.36 m. above the surface of the streets; this distance leaves a clearance of 5.20 m. under the beams, which is sufficient to allow the passage of the highest loads circulating in Paris. The elevated stations are constructed on the same plan as the viaducts. Each station, with a total length of 75 m., is com-



A standard station, whether arched or metal-roofed, has two side platforms 75 m. long and 4.10 m. wide; the level of these platforms is 0.25 m. under the floor of cars, supposed to be new and empty, and 0.85 m. above the rail. The stations are reached by staircases opening on the streets. These

The side beams of the viaducts have N-shaped lattices, their lower chords being straight and their upper ones parabolic. Their average height is about one-tenth of the span, and they are either single or composed of two built beams according to the

The masonry used in the Metropolitan System is made almost exclusively with cement mortar. Lime has been used only in exposed masonry, such as piers supporting the iron structure in the elevated parts of the system. In underground work, two kinds of masonry are used: sandstone masonry and

concrete. The first is used for arches and the second for side walls and floors.

The sandstone used is a silicious, light, and porous stone, which easily takes the mortar and is found around Paris, chiefly in ground of tertiary formation. The pebbles used for the concrete are found in great numbers in the alluvions of the Seine basin. The cement used is a slow-setting Portland cement or a slag cement. The Portland-cement mortars are mixed at the ratio of 300 kg. per cu. m. of sand when they are used for masonry and at the ratio of 400 kg. for the same volume of sand when used for concrete. The slag-cement mortars are proportioned at a ratio of 50 kg. more. The concrete is composed of 0.80 cu. m. of broken stone for 0.55 cu. m. of mortar.

Cut-stone masonry is used for exposed structures, such as great bridges on the Seine, supports for viaducts, works at points where the road changes from elevated to underground. Inside the stations all visible facings are covered uniformly with white tiles made of enameled ceramic sandstone, or of opalin or even sometimes of enameled bricks. All other works are coated only with cement; quick-setting Vassy cement for the arches, and Portland cement for side walls and floors. The viaducts and generally all metallic work such as bridges, roofs of tunnels or stations are made of soft rolled steel elongating 23 per cent. under a breaking load of 43 kg. per sq. mm. of section.

In driving the tunnels under the surface

are made over the whole surface of the arches and to 0.50 m. below the springing. Cement mortar gaged at the ratio of 650 kg. of Portland cement per cu. m. of screened sand, is injected with the Greathhead injector or a similar device. The usual pressure is from 2 to 3 kg.

The standard cross-section is of course reinforced in ground without any solidity or when the tunnel has to support exceptional loads, as when it passes under other galleries for instance.

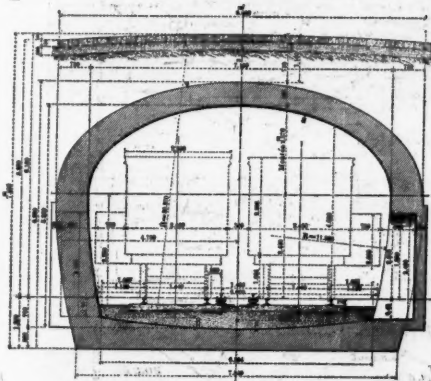
For quite a long distance, the tunnel runs under counter-alleys or wide gravel side-walks planted with trees, so that during the rainy season or when the trees are watered troublesome infiltrations penetrate through the masonry. If special precautions are not taken. The method adopted has been to dispose small circular conduits with a diameter varying from 0.06 to 0.07 m. and opening under the floor, carefully along the inside surface of arches and walls. The water drained into these conduits is absorbed in the adjacent sub-soil or is carried to drainage wells. In order to make these conduits in the arches, straw strands are imbedded in the masonry when building but not so deep as not to appear on the intrados. After taking down the centers, these strands are removed and replaced by rubber tubes; a coating of quick-setting cement mortar is then applied to the tubes and the conduits are made by removing the rubber tubes.

In the parts of the tunnel constructed en-

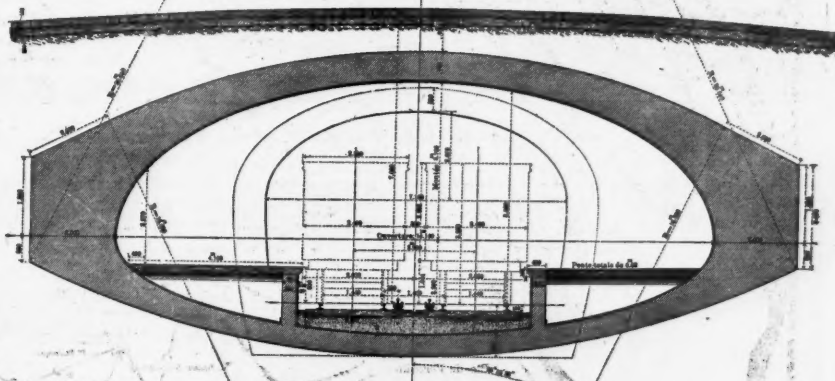
cavated material and the carrying in of materials of construction. If it is considered that when the bench is removed an average section produces from 800 to 1,000 cu. m. per 24 hours, it is easy to understand how difficult it was to remove such amount of earth by means of ordinary carts in the center of the heavy traffic of Paris. Methods more modern, more rapid and more economical have been sought. For instance in the central part of Line No. 1 running at a short distance from the Seine, the contractors built special galleries many hundreds of yards long in order to connect the tunnel with the Seine and thus allow the removal of the excavated material by boats. At other points the street car tracks connecting with the suburbs of Paris have been taken advantage of; spurs have been constructed from these tracks to the elevators in the working sites so as to allow the direct removal of excavated material without reloading. Even on Line No. 3 the earth coming from the central sections near the St. Lazare Station, the Opera and the Bourse, has been carried beyond Paris by means of a temporary spur specially constructed to connect with the Ouest Railroad.

Swiss Railroads.

The executive council of the Swiss State Railroads has drawn up its estimates for the year 1905, and accompanied them with a warning that the authorities should be more



Section of Tunnel.



Cross-Section Through Typical Station.

on certain portions of the lines an advance heading was dug at the highest part of the tunnel and the arch constructed by cutting. At certain points satisfactory results have been obtained by digging two headings simultaneously, one at the top and the other at the bottom of the tunnel, the last one being kept about 50 m. longer than the first. The lowest heading is used to carry out the diggings and the upper one, to bring in the materials for building the arch. This process which, however, can be applied only in solid ground, simplifies very much the organization of the plant.

The arch masonry is made generally in rings 3 m. long. The side walls are built from the arch down in sections whose width varies with the firmness of the ground encountered; where the ground is solid the bench is nearly all taken out before the walls are begun; where, on the contrary, the ground is liable to cave in, side trenches of variable dimensions are cut before the bench is taken out. When the arch and the retaining walls are completed, grout is injected systematically behind the masonry so as to fill all empty spaces which are likely to remain between the masonry and the ground. These injections are made through holes left in the masonry during the construction; they

tirely in water-bearing ground, the following process has given good results in keeping out the water. The masonry is constructed in a single ring along the whole development of side walls and floor. There are two layers of masonry separated by an inside cope, 0.030 m. thick, made of compact, tempered, well-rammed, cement mortar. The cement used is Portland cement gaged in proportions of 650 kg. per cu. m. of sand, or, quick-setting Porte-de-France cement gaged at 1,000 kg. per cu. m. of sand. The cope is made with the greatest care without any solution of continuity and each new section is carefully joined to the last one whose end is scraped and washed. As soon as the cope is finished on the surface of a ring, the second layer of masonry is begun, taking care not to injure the cope. Where Line No. 3 crosses under the St. Martin Canal at the Avenue de la Republique, the tunnel is laid entirely in aqueous ground for 76 m. and partially for 340 m.; it has been constructed as explained above, and the infiltrations do not exceed 550 liters per 24 hours which is equal to 0.0064 liter per second.

One of the most intricate problems to solve in the construction of the Metropolitan Railway has been the removal of the ex-

conservative for the future. Unless there should be an unexpected increase of traffic, the expenditures (including interest on cost) are likely to be \$400,000 more than the receipts next year, and provision already made for increasing wages will still further increase expenses in 1906. When the railroads were acquired by the State, the legislature provided for considerable improvements, and more liberal train service, some increase in the number of employees and a general increase in their pay and privileges, and at the same time some reductions in rates.

The Simplon Tunnel.

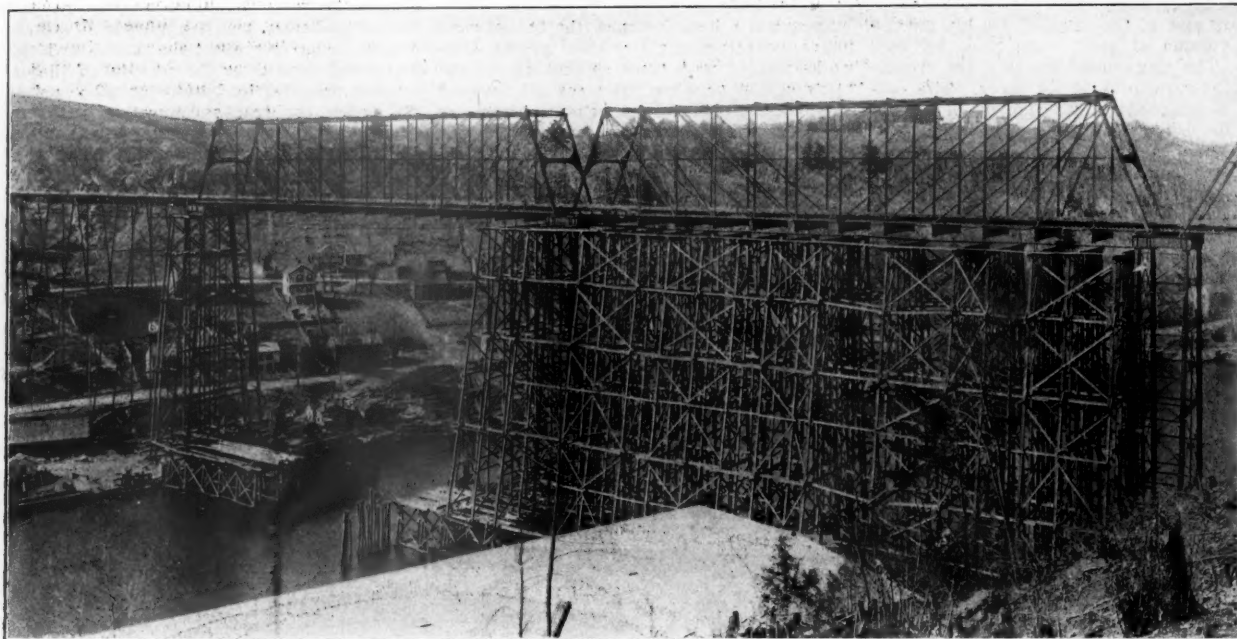
The unfortunate Simplon Tunnel, which, until the hot water spring was struck by the south heading Sept. 6, was to be open through by the middle of October, is now unlikely to be done before the end of this year, and possibly not till months later. It will be remembered that the north heading had advanced about half a mile beyond the midway summit when hot-water springs were struck, the difficulty of draining which up over the summit, caused the abandonment of work on that face. Water-tight iron

gates were set up, which dammed the water at that place and made it possible to continue the work of enlarging the tunnel and revetting it with masonry where necessary up to that point, awaiting the excavation from the south, which was behind hand because of difficulties encountered at earlier stages of the work. The hot spring is formidable not on account of the quantity discharged, which is much less than some other

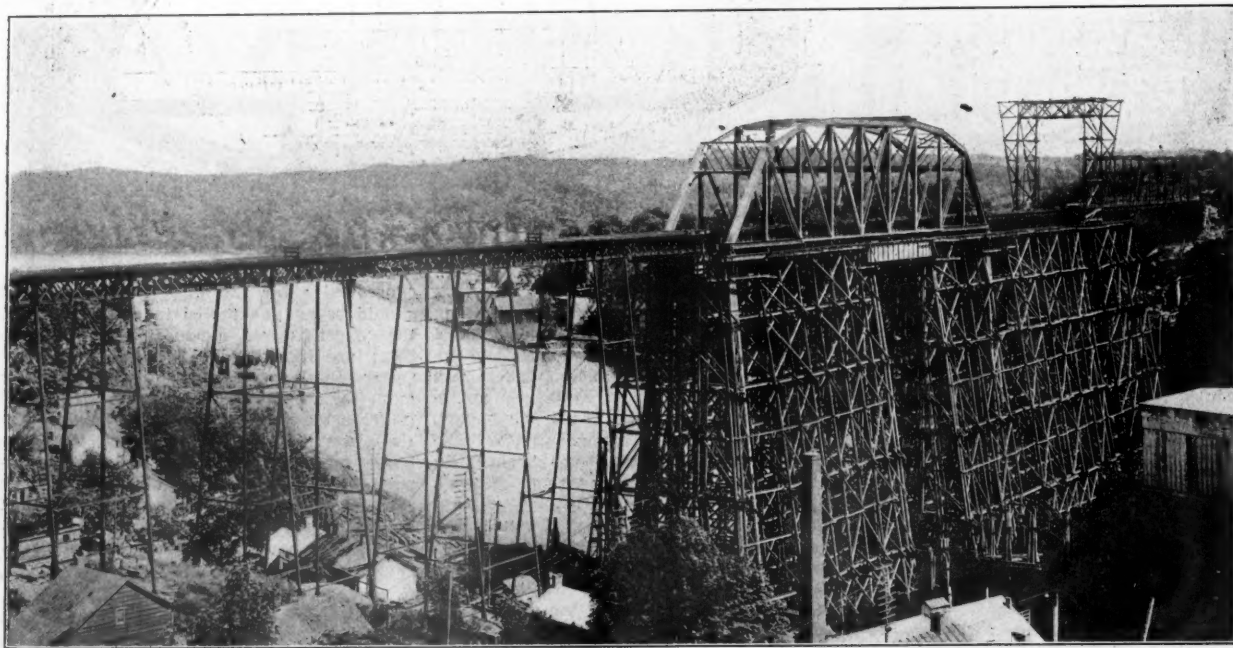
cooling apparatus which alone will make it possible to work in rock which has a temperature of 109 deg. The rock is so broken up that it is necessary to arch the side tunnel at the bottom in many places near the present south face. When work was resumed on the south face of the main tunnel (which was to be done in October), machine drills could not be used until it had advanced some yards past the hot spring, and the operators

Renewing Bridges on the West Shore.

It has long been the aim of the New York Central to utilize the West Shore Railroad which it owns and operates, for hauling all of the heavy through freight between New York and Buffalo and to use its main line, which is four-tracked for most of the distance, for fast freight and passenger trains. The West Shore between Albany and Buf-



Old Rondout Viaduct Showing Falsework Partially Completed.



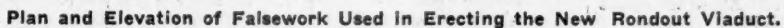
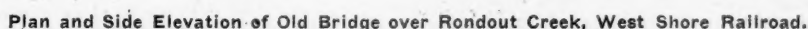
New Rondout Viaduct Showing Completed Falsework and Traveler.

springs which have been cut; but because it makes it too hot to work. The south heading was advanced only 81 ft. in September, leaving 798 ft. between it and the north face.

After Sept. 6 the work was almost exclusively in cutting a drainage channel to the side tunnel (which hereafter is to be excavated for a second track) in walling out the hot spring, and getting in order the

with the hand drills have an exceedingly uncomfortable task, in spite of the streams of cold water forced in to keep down the temperature. If no more hot springs be encountered it will probably be possible to cut the main tunnel through by the end of this year; but the character of the strata at both faces is very unpromising—limestone, much fractured, which according to the geologists was not likely to be found at this depth.

falo parallels the Erie Canal and the New York Central. It is a double-tracked road, but never since it was first built in the early eighties has it been up to the standard of a first class road. Some six years ago the New York Central began a systematic scheme of improvements designed to ultimately put this road in shape for handling heavy traffic. This work, which included laying heavy rails,



NEW BRIDGES ON THE WEST SHORE RAILROAD.

River Division, Weehawken to Ravenna, Bridges over 75 Ft. in Length.

| Bridge No. | Location | No. of Spans | Tracks | Type | Total length of bridge |
|------------|-----------------|--------------|--------|---------------------------|------------------------|
| 4 | Granton | 1 | 2 | T. P. G., F. B. & S. | 121 ft. 6 in. |
| 8 | Little Ferry | 1 | 2 | T. P. G., F. B. & S. draw | 102 ft. 8 in. |
| 17 | West Nyack | 1 | 2 | D. P. G. | 86 ft. |
| 64 | Cornwall | 1 | 2 | T. P. G., F. B. & S. | 87 " |
| 25 | West Haverstraw | 1 | 2 | D. P. G. | 84 " |
| 96 | Marlborough | 1 | 2 | T. P. G., F. B. & S. | 82 " |
| 141 | Kingston | 20 | 2 | Viaduct | 1,228 " |
| 152 | Mt. Marlon | 5 | 2 | D. P. G. | 448 " |
| 172 | Catskill | 18 | 2 | D. P. G. & D. L. viaduct | 1,222 " |
| 185 | North Baltimore | 4 | 2 | D. P. G. | 221 " |

Smaller Bridges: 13 deck plate girders, 14 through plate girders, 15 I-beam and plate bridges.

Mohawk Division, Ravenna to Syracuse.

| | | | | | |
|-----|------------------------|---|---|------------------------------------|---------|
| 197 | Bethlehem | 4 | 2 | D. P. G. & T. P. G. viaduct | 186 ft. |
| 199 | Bethlehem | 1 | 2 | T. R. T., F. B. & S. | 103 " |
| 213 | Pullers | 3 | 1 | D. R. T. & D. P. G. | 347 " |
| 337 | Harbor over Erie Canal | 1 | 2 | T. R. T., F. B. & S. | 172 " |
| 340 | Utica | 4 | 2 | T. P. G., S. F. on columns | 184 " |
| 346 | New York Mills | 2 | 2 | D. P. G. | 104 " |
| 356 | Clark's Mills | 2 | 2 | D. P. G. | 104 " |
| 404 | Canaserago | 2 | 2 | T. R. T. & S. F. & T. P. G., S. F. | 236 " |
| 412 | Chittenango | 2 | 2 | T. P. G., S. F. | 88 " |
| 372 | Vernon | 2 | 2 | T. P. G., S. F. | 90 " |
| 383 | Oneida | 2 | 2 | T. P. G., S. F. & D. P. G., S. F. | 114 " |

Smaller Bridges: 10 deck plate girders, 18 through plate girders, 6 I-beam and plate bridges.

Western Division, Syracuse to Lyons.

| | | | | | |
|-----|----------------------------|---|---|-------------------------|---------|
| 443 | Amboy | 3 | 2 | D. P. G. | 139 ft. |
| 453 | Jordan | 1 | 2 | T. R. T., F. B. & S. | 129 " |
| 454 | Jordan, over Erie Canal | 1 | 2 | T. P. G., F. B. & S. | 116 " |
| 457 | Weedsport, over Erie Canal | 1 | 2 | T. P. C. T., F. B. & S. | 207 " |
| 461 | Port Byron | 3 | 2 | T. P. G., F. B. & S. | 181 " |
| 470 | Clyde, over Erie Canal | 1 | 2 | T. R. T., F. B. & S. | 168 " |
| 471 | Clyde | 2 | 2 | T. P. G., F. B. & S. | 109 " |
| 473 | Clyde | 2 | 2 | T. P. G., F. B. & S. | 121 " |
| 474 | Clyde | 2 | 2 | T. P. G., F. B. & S. | 188 " |

Smaller Bridges: 4 deck plate girders, 3 through plate girders, 1 I-beam and plate bridge.

re-ballasting, and renewing bridges, has been going on steadily and is now nearly completed.

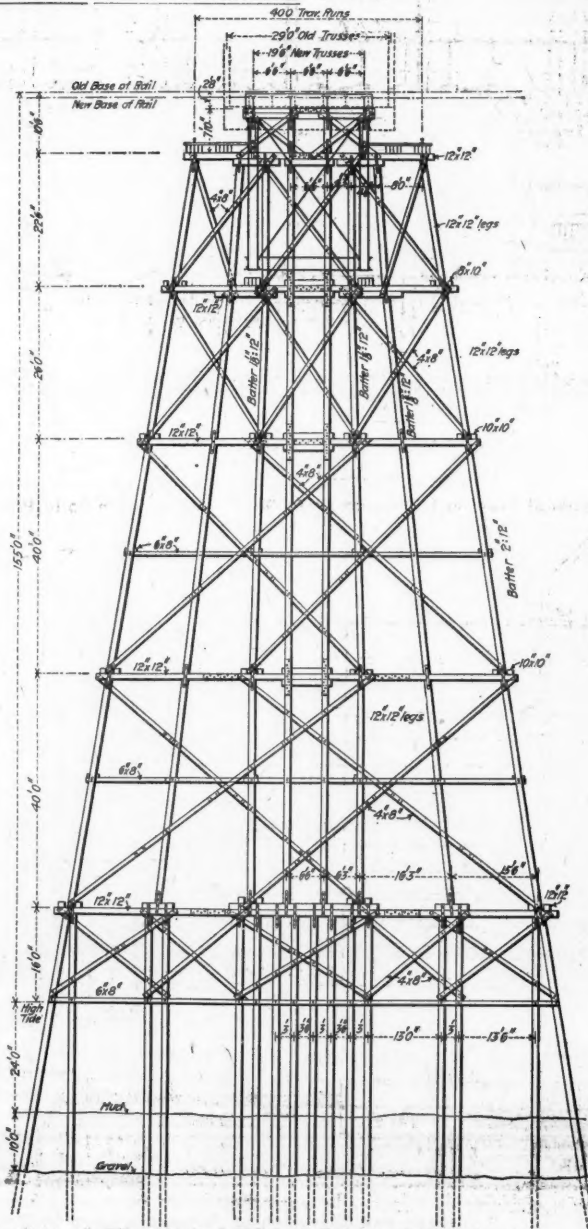
An interesting feature of this betterment policy was the renewal of nearly all of the bridges on the West Shore from Weehawken to Buffalo, which necessarily had to be done without interrupting the already heavy traffic. The greater part of this renewal work has now been completed. Thirty bridges of over 75 ft. in length have been renewed with new and modern steel structures and 84 smaller spans have also been renewed. The old bridges taken out were mostly built of iron, having been put in when the road was first built. In addition to this all of the remaining bridges have been thoroughly overhauled, repaired and strengthened. The accompanying table shows the location, type and span of the important bridge renewals on each division from Weehawken to Buffalo. About 9,000 tons of steel were required in all for the renewals on the River Division and as much more for new bridges between Ravenna and Buffalo.

All of the new bridges have been built to conform to the standard specifications of the New York Central. In general the type of bridge selected was as follows: For spans up to 13 ft., solid rail floor; for spans up to 25 ft., rolled beams with cover plates or longitudinal trough floors; for spans from 25 ft. to 100 ft., plate girders; for spans from 100 ft. to 180 ft., riveted trusses; for spans of over 180 ft., pin connected trusses. The truss spans are usually of the sub-trussed Pratt type. For all bridges the standard assumed live load is two consolidation engines and tenders with a total wheel base of 104 ft., a total weight of 284 tons, and 40,000 lbs. on each driving axle, followed by a uniform load of 4,500 lbs. per lineal foot of track. An alternative loading also used is 60 tons equally distributed between two axles spaced 7 ft. apart followed by a uniform load of 4,500 lbs. per lineal foot of track beginning 5 ft. behind the rear axle.

The new bridges were all designed in the office of the Chief Engineer of the New York Central and were built by the American Bridge Company, and the Pennsylvania Steel Company. Some of the truss bridges and most of the plate girder bridges and short rolled beam spans were erected by the railroad company's own forces. All other spans were erected by the contractors.

The two most important bridge renewals made were the viaduct over Rondout creek, a mile south of Kingston on the River Division, and the Catskill viaduct at Catskill. The Rondout viaduct is the longest bridge on the line being 1,228 ft. long, and the Catskill viaduct, which is the next longest, is 1,222 ft. long. The old bridge at Rondout, built in 1882, consisted of three iron, Whipple, through truss spans at the south end, 162 ft., 235 ft. and 255 ft. long respectively, supported on iron latticed towers and seven deck latticed girders for the north approach, resting on light iron towers with short connecting girders over the tops of the towers. It was a light structure throughout, being designed only for loads of two 80½-ton consolidation engines followed by a moving load of 2,240 lbs. on each track. The level of the base of rail above high tide on the old bridge was 154 ft. 6 in. A sketch of the original structure is shown in one of the accompanying drawings.

The new bridge put in consists of three deck plate girder approach spans at the south end, one deck truss 143 ft. long, one through truss 270 ft. long over the channel, and seven deck plate girder approach spans at the north end. New steel towers were



Elevation of Typical Falsework Bent.

built to support the structure and the bridge as renewed will now carry the heaviest traffic on both tracks simultaneously at high speeds. A comparison of the accompanying drawings of the old bridge and the new bridge shows the changes in the substructure made necessary by the renewal. At the south end the old abutment was allowed to remain as before but a new coping course and back wall were put in. About halfway down the bank, two pier foundations were put in for the rocker bent supporting the plate girder approach spans, Nos. 1 and 2. The foundation piers for the old tower at the foot of the south bank were used for supporting the outer legs of the new tower and two new piers were built higher up the bank to support the in-shore legs. Tower 3 is entirely new and the four piers resting on piles were sunk before the tearing down of the old bridge had begun. The piers for all of the other towers are the

original masonry with new coping courses. The towers under all of the approach spans consist of four legs battered 1 to 8 toward the center line of track but vertical in a longitudinal plane. They are 29 ft. 6 in. between bents and the tracks are carried over them on short plate girders. All of the towers are stiffened longitudinally and laterally with diagonal and cross-braces, and towers Nos. 5 and 6 are also connected together top and bottom with stiffening trusses.

After the new masonry was completed and before the dismantling of the old bridge was begun, falsework was built up from the ground and the bottom of the creek to support the track while the bridge was being renewed and to form a runway for the traveler used in erecting. This falsework consisted of 41 bents supported on piles and tied together with 4-in. x 8-in. diagonal braces and longitudinal struts. The two

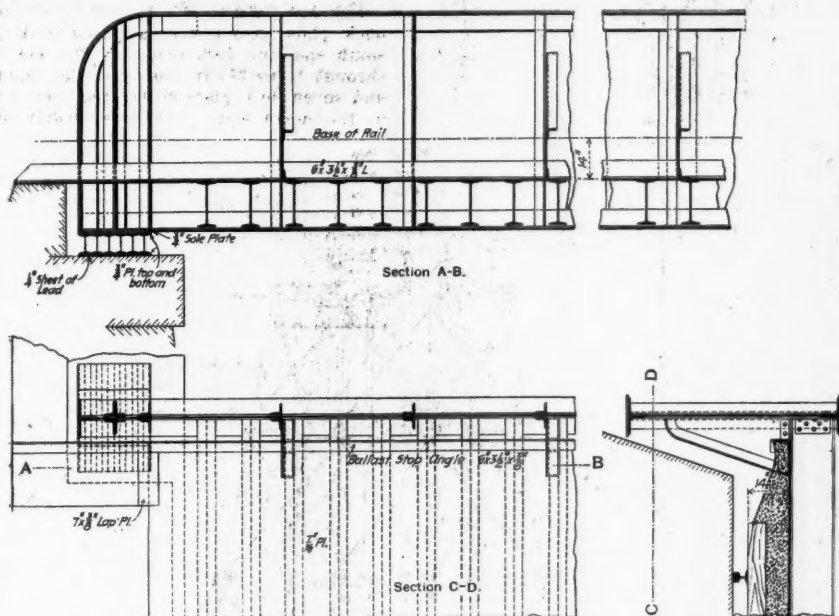
outside posts on each side of the bents were battered and the four middle posts were vertical. The bottom sill rested on the tops of the piles which were driven in pairs under each post and the number of stories in each bent was varied according to the rise of the bank. As far as possible all the braces, sills and caps were made of uniform sizes to save cost in getting out the timbers in the mill. A general plan and elevation of the falsework and an elevation of a typical bent under the deck span are shown in the drawings.

The stringers, laid on the caps of the bents, were all 8 in. x 16 in. and were grouped in banks of three under each rail and in banks of two under the traveler runway on the outside. The bents were spaced, in general, 15 ft. apart and the stringers were made 32 ft. long to rest on three bents. Where the towers interfered with the regular spacing of the bents, 18-in. I-beams, three under each rail, were substituted for the wooden stringers. Rondout creek is navigable for canal boats and small steamers and it was necessary to preserve a clear waterway in the channel. Two bents close together were built on each side of the 63-ft. clear channel opening which was left, and the eight new plate girders intended for spans Nos. 1 and 4 were laid on the caps of these bents. One girder was placed under each rail and one under the traveler runway on each side. All of the falsework was designed in accordance with Cooper's E-35 loading.

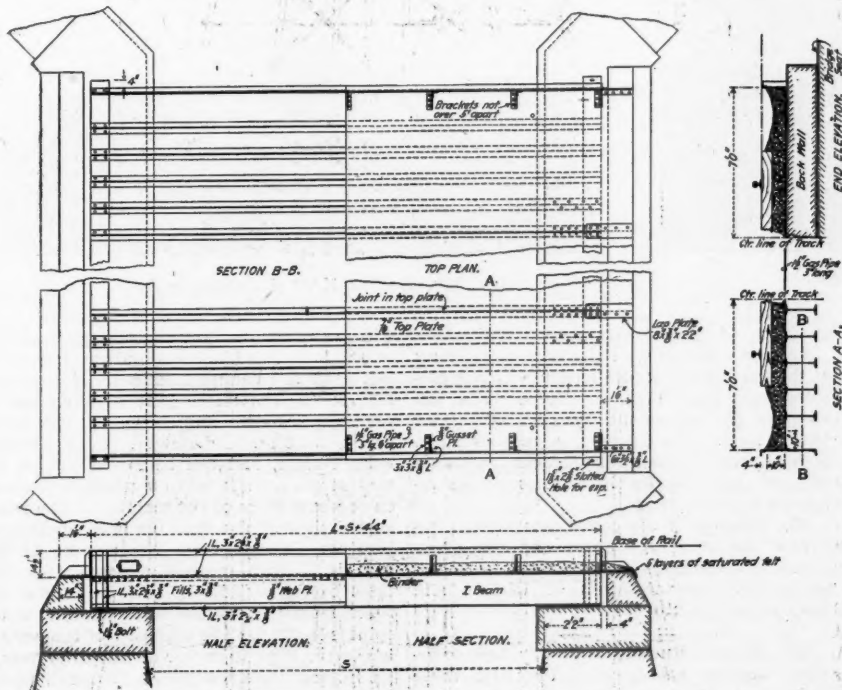
After the falsework was all up, the traveler used for dismantling and erecting was assembled on the runway and the work of taking down the old through spans was begun from the north end. The traveler used is shown in one of the illustrations from a photograph. It was of the ordinary form, having two legs or towers of four posts each with a bridge across the top having sufficient clearance to move over any of the old or new spans. The old through truss span at the north end over the channel was taken down first and the new 270-ft. truss was erected on the new towers already built up from below. The second through truss was then taken down and as the work progressed the iron stringers over the channel tower were floated ahead to rest on the pony bents of the falsework, no wooden stringers being put in under that part of the old span above the new deck truss. After the deck truss had been erected, the remaining through truss was replaced with the plate girders used in the temporary span over the channel and finally the latticed girders in the north approach were replaced with plate girders resting on the new towers. The whole work was done with little interruption of traffic and with no accidents. The American Bridge Company, which built the superstructure at its Pencoyd, Edgemoor and Athens plants, designed and built all of the falsework and erected the bridge on the site. About 3,000 tons of steel were used in the superstructure.

We are indebted to Mr. Olaf Hoff, Engineer of Structures, New York Central, for the illustrations and information.

The Prussian authorities are reported to have become satisfied that further experiments with fast trains hauled by steam locomotives on the Military Railroad are unnecessary. Based on the results attained, they will aim to increase gradually the speed of express trains, not expecting to exceed a maximum of 120 kilometers (74½ miles) an hour. The authorities now are turning their attention to improved brakes. A mechanical engineer has been investigating the subject in America.



Details of Standard Through Plate Girder Bridge with Solid Plate Floor.



Details of Standard Rolled-Beam Bridge for Short Spans.

The German Railroad Union.

The convention of the German Railroad Union was held in Dantzig on Sept. 1, 2 and 3, at which delegates representing more than 60,000 miles of railroad were present. The chief subjects discussed (all presented in reports which had been long in preparation) were: The admission of electrical railroads to membership. Only lines which have through traffic, and which therefore must in certain respects be uniform with connecting railroads, are members of the Union; and this discussion is evidence that there is or is expected soon to be, an interchange between steam and electric roads, and of electric roads with each other. The committee believes that the time has come for ascertaining and formulating the regulations nec-

The subject of automatic car-couplers came to this convention from its technical commission, which had been instructed to report upon it, and has been making experiments since 1898, when the Bavarian State Railroads equipped some cars with American automatic couplers. Later a trial train of 38 cars equipped partly with American couplers and partly with the Krupp hook coupling was provided. Much information was given as to the cost and the time required for the transformation which was universally regarded as desirable; but the interchange of cars practically all over the continent west of Russia makes it desirable that it be introduced in all countries at the same time. The convention favored a con-

Railroad Shop Tools.

(Continued.)

UPRIGHT DRILLS.

The 26-in. upright drill, Fig. 1, is made by the Hoefler Manufacturing Company, Freeport, Ill. It is fitted with a sliding head, lever, wheel and power feed, automatic stop and back gears. The spindle is $1\frac{1}{16}$ in. in diameter and has a vertical adjustment of 12 in. by means of a rack and pinion. It is driven by cut steel gears and is provided

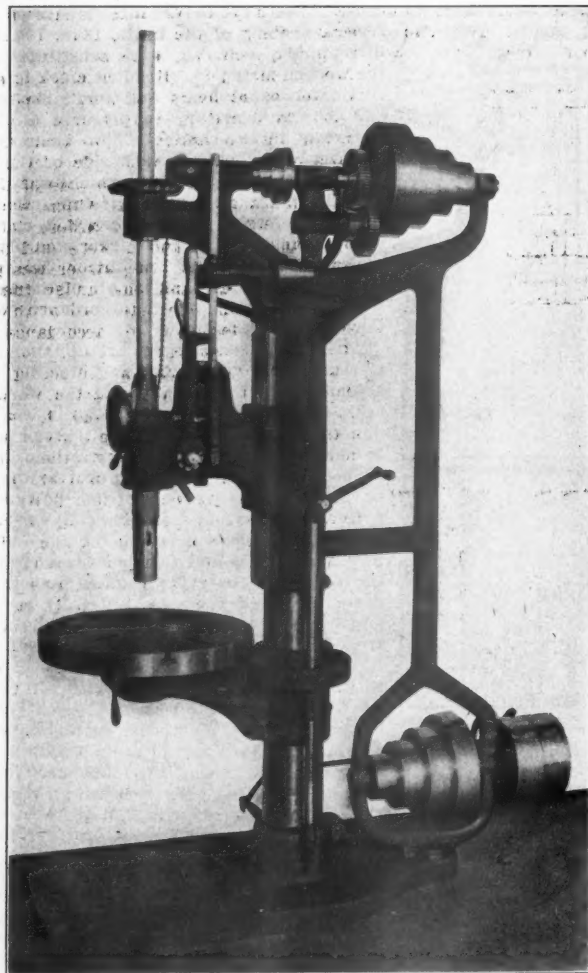


Fig. 1—The Hoefler Upright Drill.

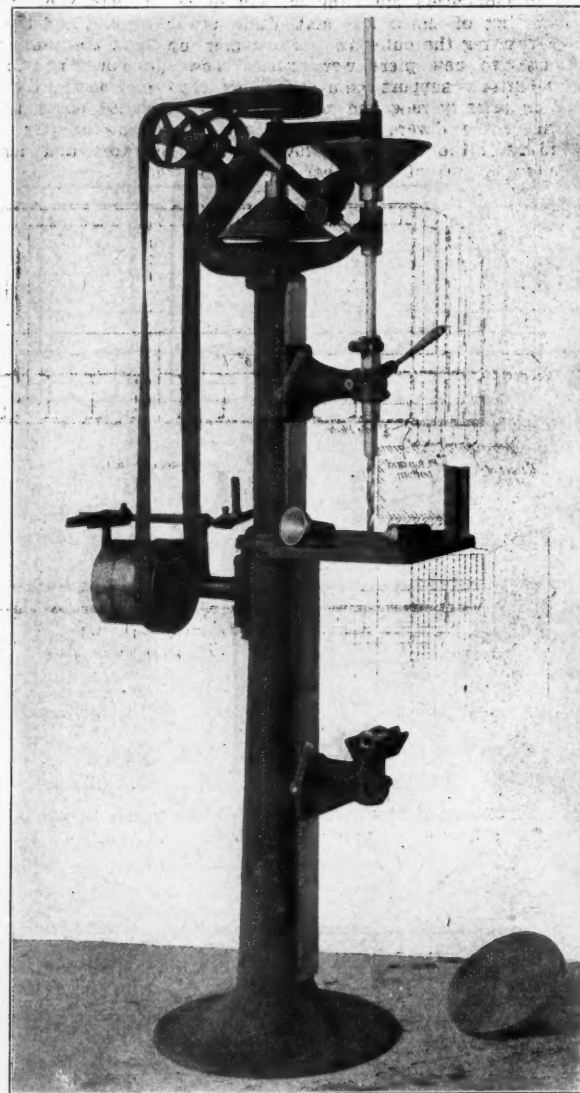


Fig. 2—The Knecht Sensitive Drill.

essary for such interchange; and it was instructed to prepare such a body of rules.

Another subject was the continuance of what we would call coupon passenger tickets for routes not only over different railroads but in different countries. These tickets are issued for lines not only belonging to the Union but also for railroads in France, Italy, Belgium, Scandinavia, the Balkan States and Finland, and numerous steamship lines on the North Sea and the Mediterranean, and next year will extend also into Africa, over the Algerian railroads. Heretofore such tickets were authorized at each convention only for the two years till the next convention. At Dantzig it was decided that they should continue to be authorized until action to the contrary is taken.

tinuance of experiments on a larger scale.

President Kranold, of the Berlin Directory of the Prussian State Railroads, who has presided over the Union for eleven years, announced his retirement from active service May 1 next. The convention chooses not a person but a railroad management as its executive; and the Berlin Directory was re-elected for four years.

The sessions of the convention usually occupied the mornings only, and the afternoons and evenings were devoted to excursions and entertainments of various and very attractive kinds.

The private Russian railroads had somewhat greater earnings in the first three months of this year than last year.

with anti-friction fiber collars and a quick return lever. Both the spindle and the sliding head are counterbalanced. A combination screw and miter gear arrangement is used for raising and lowering the table, which is 22 in. in diameter. It is provided with T slots, and can be swung out of the way of the spindle when work is to be done on the base plate of the machine. The maximum height of the machine is 80 in. and the greatest distance from the spindle to the base is 45 in.; greatest distance from the table to the spindle is 27 in., and the distance from the column to the center of the spindle is 13 in. The diameter of the column is $6\frac{1}{2}$ in. The diameter of the large gear is 8.4 in. and the diameter of the small pinion is 4 in. A floor space 58 in. x 22 in. is re-

quired and, the net weight of the machine fitted complete is about 1,500 lbs.

The Knecht friction sensitive drill, Fig. 2, made by The Knecht Brothers Company, Cincinnati, Ohio, is used in many railroad shops, and it is especially adapted to tool-room use. A wide range of spindle speeds can be obtained without stopping the machine. These speed changes are procured by sliding the friction roller frame, upon which is mounted the friction roller, up and down on the cones, from one extreme to the other, a distance of only $4\frac{1}{2}$ in.; any number of speeds can be obtained for any size drill from the smallest up to and including $\frac{3}{16}$ in. The driving friction roller is built up of leather disks, held firmly between two iron flanges. These leather disks are durable and are easily replaced. More or less driving power to the drill spindle can be applied as the size of the drill or the nature of the work may require by turning a hand adjusting nut under the rear driving cone, which increases or decreases the tension of the friction roller between the two cones. The cone that drives the spindle is mounted on a sleeve or bushing which extends through

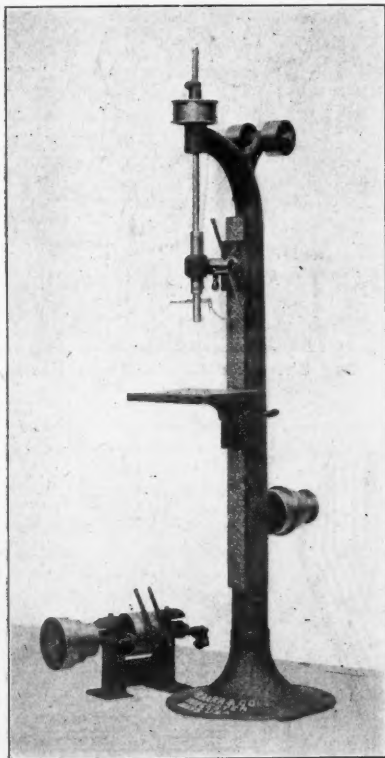


Fig. 3—The H. G. Barr Vertical Drill.

both bearings in the frame. The spindle is thus relieved from any lateral pressure and the pressure on the driving mechanism is thrown upwards and is relieved by a thrust bearing. Graduations for speed are marked on the bar on which the friction roller frame slides, so that the operator by placing the end of the roller frame at the figures on the bar corresponding to different sizes of drills and clamping it in position by means of clamping screw can always obtain the proper speeds for drilling. Other graduations for indicating the depth of the hole to be drilled are placed on the sleeve which passes through the spindle bracket. A stop collar is also provided by means of which any number of holes may be drilled to the same depth. Ball-bearings placed between the collar on the spindle and the sleeve reduce the friction to a minimum and the spindle is counterbalanced by a quick-acting coil

spring. The driving pulleys are enclosed in a frame which is adjustable on the column and by means of a small adjusting screw any desired belt tension may be obtained. An endless belt is furnished with each machine. Two brackets, one for the spindle and another for a round table, are provided; both of these are adjustable on the column and can be clamped in any position by the attached wrenches. Both sides of the square table are finished, so that in case it becomes defaced it can be reversed, and practically becomes a new table. It is $\frac{3}{8}$ in. thick and can be swung aside so that the drills can be used on work held in the lower round table bracket. This machine will drill holes up to $\frac{3}{4}$ in. in diameter in cast iron. The general dimensions of the machine are as follows: Height of drill, 76 in.; distance from column to center of spindle, $6\frac{1}{2}$ in.; greatest distance from end of spindle to round table, 42 in.; vertical adjustment of round table, 28 in.; vertical adjustment of spindle bracket, 13 in.; diameter of spindle, $\frac{11}{16}$ in.; throw of spindle, $3\frac{15}{16}$ in.; hole in spindle conforms to Morse taper No. 1; square table, $12\frac{1}{2}$ in. x 14 in.; round table, $10\frac{1}{4}$ in. in diameter; floor space required, 20 in. x 34 in.; largest size of driving pulley, $7\frac{1}{2}$ in. x 2 in.; size of countershaft pulleys, 7 in. x 2 in.; speed of countershaft, 460 r.p.m.; driving belt, $1\frac{1}{2}$ in. wide; endless belt, $1\frac{1}{2}$ in. wide by 9 ft. 8 in. long.

The No. 1, 14-in. swing, vertical drilling machine shown in Fig. 3 is made by H. G. Barr, Worcester, Mass. This is a useful machine for the tool room or for drilling oil or tap holes up to $\frac{1}{2}$ in. in diameter. It has a counterbalanced spindle, a sliding head and lever feed. The table is 11 in. square and has an adjustment of 32 in. on the column. Maximum distance from the table to the spindle is 27 in. and the distance from the post to the center of the spindle is 7 in. The spindle is $\frac{3}{4}$ in. in diameter and has a vertical traverse of $3\frac{1}{2}$ in. by means of a rack and pinion. The sliding head has a vertical adjustment of $7\frac{1}{2}$ in. Graduation is provided on the spindle quill and the total height of the machine is 6 ft. 5 in. It requires a floor space of 20 in. x 26 in. and its net weight is 255 lbs. Multiple spindle drilling machines having similar spindle arrangement to the one shown are also made by H. G. Barr. The spindles of these machines can be independently driven when desired and they are provided with three different speeds. The table is in one piece and is raised and lowered by means of a screw inside of the column.

RAIL DRILLING MACHINE.

The rail drilling machine, Fig. 4, is made by the Mark Flather Planer Company, Nashua, N. H. It has a capacity for drilling three holes $1\frac{1}{4}$ in. in diameter in steel rails. Any distance from $3\frac{1}{4}$ to $9\frac{1}{2}$ in. can be obtained between the spindles. The two outer spindles have a vertical adjustment of $3\frac{1}{2}$

in. by rack and pinion, and can be clamped in any position required. The spindles are bored out for No. 4 Morse taper, and on account of the spindle adjustment, taper shank drills can be used, thus doing away with the set screws which are used for the adjustment of straight shank drills.

The three spindles are carried on one saddle, which is counterweighted and feeds the three spindles simultaneously. The center spindle is driven by a large planed bevel gear on top of the column, and this in turn drives the two outer spindles by spur gearing through intermediate gears that are pivoted to both the central and outer spindles and move in and out with the horizontal movement of the spindles.

The saddle carrying the spindle has three changes of power feed and quick return. The

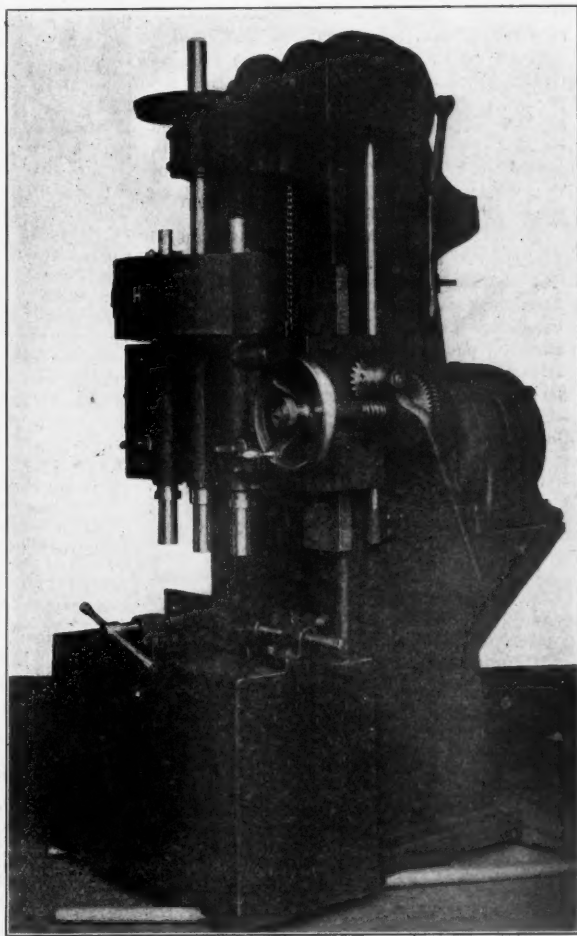


Fig. 4—The Flather Rail Drilling Machine.

feed is driven by cones of gears, has three changes, and is changed quickly by a lever on side of column. The work table is provided with adjustable vise for holding the rails, and both right and left hand stops for end of rail can be used.

The borings drop through an opening in top of table and out through an opening in back of column, taking them out of the way of the operator. There is also an opening 10 in. square through the back of the column level with the top of table, allowing work to be put through the column to be operated on. The principal dimensions are as follows: Height to top of cone pulley, 8 ft.; width of face of columns, 26 in.; dimensions of top of box table, 18 in. x 36 in.; height from top of table, 24 in.; length of saddle, 39 in.; width of saddle, 16 in.; minimum distance of centers of spindles, $3\frac{3}{4}$ in.; maximum distance of centers of spindles, $9\frac{1}{2}$ in.;

width of driving belt on cone, 3 3/4 in.; largest diameter of cone pulley, 18 in.; weight about 6,300 lbs.

(To be continued.)

How to Maintain Surface, Line and Gage.*

To maintain perfect surface, line and gage, it is essential, first, to have banks sufficiently wide, with a slope of 1 1/2 to 1, and so prepared for ballast as to permit of perfect drainage. The shoulder should slope slightly from the base of the ballast and should be wide enough to extend at least 7 ft. outside the rail.

It is important that ballasting should be well done according to the best standards; ties should be as near uniform in width and thickness as is possible, and spaced equally center to center; they should be lined on one side of track, preferably the line side of track. Care should be taken that ties are perfectly square across the track, and that all ties are equally and thoroughly tamped outside the rail and 16 in. inside the rail, leaving a space of 22 in. in the center of the untamped, which, however, should be thoroughly filled under the ties.

Track when ballasted or given a general surface should be put up to perfect surface, line and gage, and a shoulder of ballast sufficiently heavy to hold same in line should be distributed; for first class track, the shoulder should be 5 ft. outside the rail, 2 1/4 ft. level and 2 1/2 ft. slope. The track should be filled inside to the level of the base of the rail, keeping the flange of the rail and top of ties clean.

Where the roadbed happens to be on a level with lands on either side of track, ditches sufficiently large to insure perfect drainage should be dug outside of and parallel with the shoulders of the track.

For cuts, the roadway should be sufficiently wide to permit of ditches outside the shoulder to thoroughly drain all surface water, and if cuts are spouty or underlaid with quicksand, they should be tiled in addition to ditches, the tiles being laid in a V-shaped trough made of 1-in. x 6-in. fencing lumber, just below the theoretical frost line, and covered with fire-box cinders to a depth of at least 1 ft. The sides of the cut should be sloped 1 1/2 to 1 ft. where possible, faced smooth and kept free of obstructions that may cause portions to slide down, filling ditches and obstructing track. Where possible, surface ditches should be maintained on embankments of cuts alongside of the right of way to carry water to the nearest water way, and prevent water flowing over the embankment, making numerous drains and washing earth down and defacing the sides of the cut. Fills should in like manner be kept clear of obstructions and the surface kept smooth.

To maintain perfect line, the track must be kept up to almost a perfect surface. Where track becomes low in places on one side and then the other, it causes a deflection to the low side of engines and cars passing over it. Under conditions of this kind the only thing to do is to raise the low track to a level, as no track can be made to stay in line when out of surface.

To maintain perfect gage, the track must also be kept in perfect surface, as the engines and cars have the same influence on gage as on line.

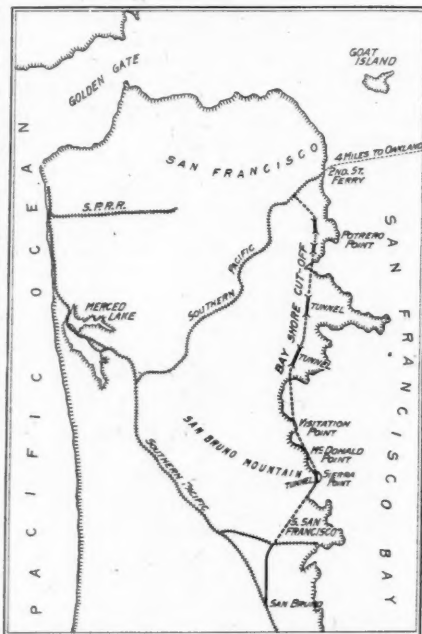
When renewal of ties is being made, the track should be carefully gaged, all spikes that are not snug up to the rail should be pulled and holes plugged, then the spikes should be redriven in the plug to prevent any oscillation. On curves of 4 deg. or over, where traffic is heavy or a high rate of speed is attained, a claw tie plate should be used to prevent the rail being crowded out by heavy engines.

Bay Shore Cut-Off of the Southern Pacific.

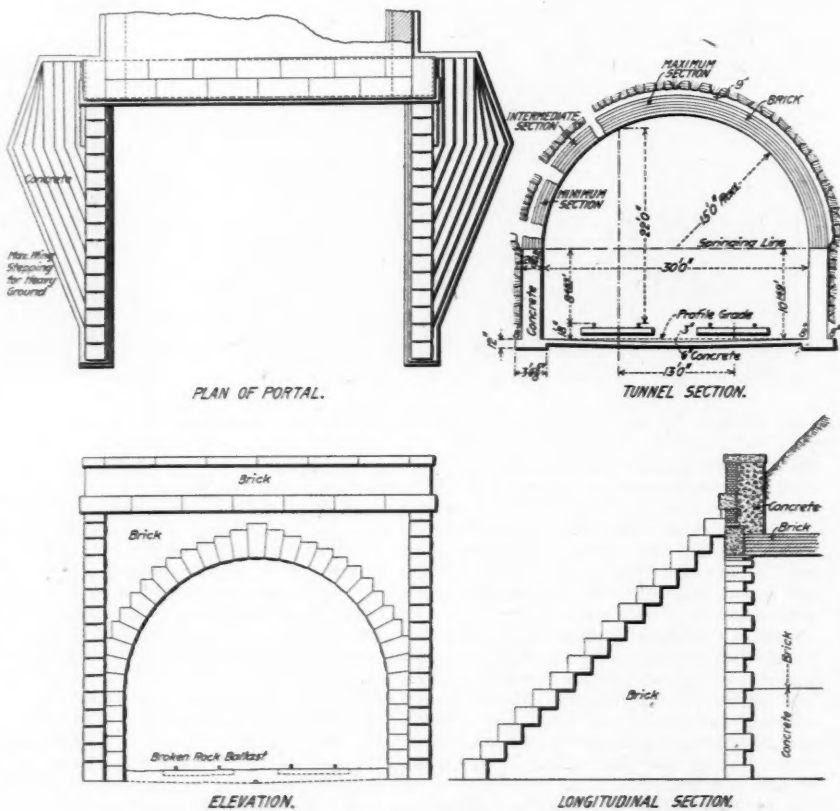
Work has recently been begun by the Southern Pacific on its Bay Shore cut-off. This line is being built to secure a more direct entrance into San Francisco for the trains of the Coast Line division. On account of the steep grades and curves in the San Bruno Mountains in San Mateo County, helping engines have to be employed for the heavier trains. By the Bay Shore cut-off these heavy grades will be avoided. The line runs along the shore of San Francisco Bay and joins the present line at San Bruno. It is about 10 1/2 miles long, and of this that part between South San Francisco and San Bruno, two miles, has already been finished, leaving eight and one-half miles between South San Francisco and San Francisco yet to be built. The distance by the present Coast Line division between San Bruno and San Francisco is 13 miles. The building of the cut-off will involve five tunnels besides some deep cuts. The maximum grade is to be .3 per cent., which is a great improvement over the grades on the present route. The cut-off will start at Townsend and Third streets in San Francisco and will then run southwest through the Potrero hills and along San Francisco Bay, touching at Visitation Point, Macdonald Point and Sierra Point, to South San Francisco.

The line will have two tracks but the rights of way, as well as the bridges over the streets in San Francisco, provide for four

tracks. The number of streets crossing at grade is very small. The five tunnels on the cut-off aggregate 1.93 miles, and their respective lengths are as follows: No. 1, 1,786 ft.; No. 2, 1,235 ft.; No. 3, 3,446 ft.; No. 4, 3,547 ft., and No. 5, 1,166 ft., a total of 10,180 ft. The heaviest work outside of these tunnels will be at Visitation Point, where there will be a cut 95 ft. deep. The tunnels will be of standard arch construction and will be faced with stone and lined with brick and concrete masonry. They will be sufficiently wide for a double track. The more important details of the tunnels are shown in the accompanying drawings.



Bay Shore Cut-Off, Southern Pacific.



Detail of Tunnels and Portals, Southern Pacific Bay Shore Cut-Off.

*Committee report to the Roadmasters and Maintenance of Way Association, presented at the 22d annual convention, St. Louis, Sept. 13.

Repairing Broken Spokes on a Driving Wheel.*

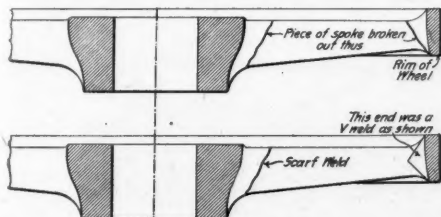
During last winter a passenger engine came into Hillyard shops for repairs. It has three pair of drivers. Cast steel centers 26 in. in diameter. The back driver on the right side had two spokes between the crank pin and the counterbalance broken off. About $1\frac{1}{4}$ in. of the hub was left on one side and about $1\frac{1}{2}$ in. on the other side, or the break formed an angle of about 60 deg. About 1 in. of stock was left on the rim.

Having no centers in stock at the general stores, and to order from the factory would greatly delay the work on the engine and keep same out of service, our general foreman came to me and informed me that he had a driving wheel center minus two spokes and wanted me to weld two wrought iron ones in place of the same. You may imagine what I thought, or how I looked.

Anyway he asked me to go along with him and look at it. So I did and I looked at it good and long.

Previous to this we had been welding in new centers in cast steel braces, so I thought if it was the same metal in the wheel center, I would undertake the job, although I must say it looked dubious just then.

In the first place I got a heavy car axle and flattened it on one end with an offset so that I could bolt it to the one side of the wheel for a porter bar. Then I got a car wheel on the other end of the axle for a



Welding a Broken Spoke.

counterbalance, with a man on the tail end to manipulate the wheel in and out of the fire.

I made the spokes of wrought iron axle and scarfed as shown in the accompanying. The rim end of the spoke I made a "V" weld as you will see in the sketch. There was hardly enough stock left to form a perfect V, so the scarf came up pretty well on the rim. I took separate heats on the first weld, which was, of course, on the hub end, and placed the V end in position, allowing stock enough to hammer down with heavy sledges, while the rim prevented it from slipping down, afterwards taking a heat on each side.

After the hub and spokes had cooled off the spokes stood off from the rim half an inch, so I had a liner to fit in between the new spoke and the rim. Before taking a heat on this end to weld, I heated the wheel each way from the new spokes so that it would give a little when the expansion took place, from welding the small end of spokes to the rim, which I welded by taking a heat on each side of the rim. Those welds turned out all right, although I was a little afraid on account of the expansion in the rim and spokes.

This wheel center had a solid rim. Sometimes, as you know, there are slots left in the rim in three or four places. Those slots we fit with shims before shrinking the tire on, but as I said before there were no slots or openings in this wheel center, so you will understand it was a little more difficult to

do a good job. After cooling off it looked O. K. The wheel was then put on the boring mill and skinned off where it was a little lumpy and the tire shrunk on. The axle fit was not disturbed. The engine has been running ever since with wrought iron spokes in a cast steel center.

University Courses in Railroad Transportation.

The University of Chicago announces a series of evening courses in railroad transportation with the object of providing special instruction for the large railroad community in and around Chicago and thus enable clerical and other staffs in the service to gain a wider comprehension of railroad working in general. Young men wishing to enter the service should find attendance upon the courses a material help and a recommendation in their favor. The announcement states that the movement has been heartily endorsed by prominent railroad officers, and the outline of courses prepared has been submitted to them and has met with their approval.

Two short introductory courses are offered first, in order to get the movement under way without delay, and also to see how it will be supported. These courses began on the 15th inst. and will continue over the third week in December. The results obtained will determine future action, and whether or not further efforts will be justified. The University signifies its willingness to undertake, subject to the approval of railroad authorities, a scheme of instruction including courses of from three months to four years duration.

The work will be primarily in charge of Professor E. R. Dewsnup, an English economist of considerable experience in conducting similar courses in England. The first of the special introductory courses, for the autumn quarter, is on Railroad Conditions and Problems, treated under the following heads: (a) the outbound freight house; (b) railroad organization; (c) roadbed and signaling; (d) equipment; (e) passenger service; (f) rates and fares; (g) railroad statistics. The second course is on English Railroad Practice. There will be one lecture a week in each for six weeks.

Subject to the successful establishment of the autumn work, the following additional courses are announced for the winter and spring quarters: (3) Railroad Conditions in the United States: Organization and Mechanism. (4) Railroad Conditions in the United States: Traffic Working and Present Day Problems. (5) and (6) History and Present Condition of Railroad Mechanism and Railroad Working. (7) History of Express Companies: Past and Present Methods. It is expected that persons engaged in the work of express companies, car lines, etc., will find much that is profitable in the work.

The foregoing covers the first year's work. The tentative outline for advanced work is as follows:

1905-6.—Railroad Organization; History of Railroad Development; Railroad Geography; Railroad Law; Freight Traffic; Railroad Finance.

1906-7.—Development and Conditions of Railroad Transportation in England; Passenger Traffic; Railroad Accounts and Statistics; Rates and Fares; Relation of Railroads to the State.

1907-8.—Development and Conditions of Railroad Transportation in France and Germany; Development and Conditions of Railroad Transportation in Other Foreign Countries; Inter-Relations of Railroads; Railroad Problems—a research class.

For students who take up regular univer-

sity residence, courses in the department of political economy are also provided, which cover the whole range of transportation economics.

Car Service Records and Car Loading.*

The Committee on Office Methods and Accounting reported on five subjects: duplication of initials and numbers in marking cars; graphic vs. book records; train and engine mileage; per diem and penalty accounts, and tracing car load shipments. On the first subject it is recommended that roads having initials similar to other roads be requested to renumber their cars; some proper authority should be designated to assign initials or numbers as may be necessary. For example, the Canadian Northern, the Carolina Northern, the Cincinnati Northern and the Choctaw Northern have many cars bearing identical numbers. The same thing occurs in private cars, as, for example, the Pennsylvania Coal Company and the Pittsburgh Coal Company. On the third subject, mileage, the committee recommends the endorsement of the rules adopted at Washington last May (page 67 of the minutes). On the fifth subject, tracing, no action is recommended, as the subject is under consideration by the Central and Western association of car service officers.

On per diem records the committee strongly recommends the interchange slip, Form A, recently recommended by the American Railway Association. Transposition of car numbers makes much work; better clerks should be employed. The committee recommends that in making up per diem reports car numbers be entered in numerical order; most roads keep their record of home cars in this order. Penalty notices should be issued in triplicate; one copy being retained by the office issuing such notice, the other two being forwarded to the road having possession of the car, the possessor road to make notation upon one copy, retaining same from which to work car home and returning other promptly to the car owner. Upon receipt of penalty notice there are various ways of handling same. A popular method is to trace the cars by wire, and when located have them tagged with penalty cards, following them up either by wire or mail until delivered off the line. Such cars may be designated on the running record by a capital "P" in colored ink entered on the date which corresponds to that upon which the penalty will become effective. Some of the larger systems make out weekly statements showing cars which are liable to penalty, these lists being furnished to the several division superintendents upon whom it devolves to have the cars released and rushed home, the home route of each car being indicated on the statement. Other plans have been suggested. The committee believes that the most effective method is to keep each penalty car in sight, following it by wire, telephone or special delivery messages as may be most available until it is finally disposed of.

On relative benefits of the graphic as compared with book records the committee secured from members of the Association data as follows: Of 100 roads answering the circular letter 85 roads use the Book Record; 13 roads use the Graphic Record for home cars and the Book Record for foreign cars; one road uses the Cabinet Record, an adaptation of the Graphic for home cars, and Book Record for foreign cars; one road uses the Pin Record for home cars and Book Record for foreign cars. None of these roads

*From a paper by W. H. James read before the National Railroad Master Blacksmiths' Association at Indianapolis, August 18, 1904.

*Extracts from committee reports presented at the meeting of the Association of Transportation & Car Accounting Officers at Cleveland, Nov. 15.

have attempted to work foreign cars by the Graphic, and of those using the Graphic for home cars seven keep a separate junction record in book form of home cars on foreign roads or draw the same off the Graphic two or three months at a time for the purpose of checking per diem.

The general consensus of opinion as expressed by these answers is that the Book Record entered direct from wheel and junction reports is the best system. While the Graphic Record has the advantage of quick location, it is found more difficult to handle per diem matters by this method than by the Book Record. It is also the general opinion that a system of transcribing is desirable after the number of records to be entered per day amounts to a figure variously estimated at 8,000 to 30,000 records per day.

This transcribing is now done in three ways—on sheets, on slips or cards, and on tickets. When tickets are used the work is usually done by typewriter. The advantage of the use of the typewriter for transcribing has not yet been clearly established. Many roads have been experimenting with it, and your committee does not feel satisfied to make a recommendation on this subject at present. Six roads tried typewriters, but abandoned them, and eight roads abandoned the Graphic Record after trial.

A number of roads use loose leaves and adjustable binders. It is the opinion of the committee that this is a good method, as it permits of increasing or decreasing the assignment to a book as the cars run lighter or heavier, also reduces cost of binding books.

The Southern Pacific Company has a form of record leaf for holding four months' home records, with the numbers at the top and the dates at the side, which strikes the committee as being a good form for roads where the record clerk is supposed to do all the work connected with the cars in his charge. Of the roads answering the circular letter 83 roads do not transcribe; 14 roads transcribe all cars; one transcribes foreign cars only; one transcribes system cars only, and one transcribes cars on conductor's reports only; four use sheets, six slips or cards, and seven use typewriters (on tickets). The average records entered per clerk per day varies with the different systems 700 to 3,000, with the average about 1,200.

A part of the Southern Pacific leaf form is shown below. The full form is for five car numbers and 31 days.*

The Committee on Car Service made a report on uniform card waybills and on loading cars to their full capacity. The committee believes that for both slow and fast freight there should be a uniform card waybill that will carry the car to destination, and, in the absence of the regular billing, enable the agent at destination to deliver the freight. Such a form would abolish bills for reclaim for per diem on account of non-arrival of the regular billing. For loading L. C. L. freight most economically the committee recommends the clearing house system; the establishment of transfer houses at suitable points to consolidate loads. If these

clearing houses are not too near together the road can afford to employ a higher grade of supervision than if there are a larger number of smaller houses. Responsibility is concentrated, claims are more quickly handled and police protection is cheaper. The clearing houses should be sufficiently few in number to warrant provision of the best facilities, including track room sufficient to place cars at platforms at one time for 24 hours' loading.

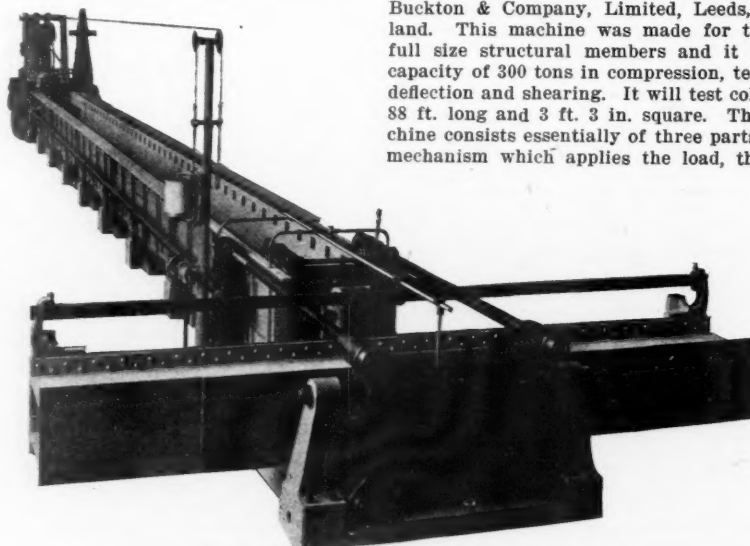
Freight sent in car loads must be dealt with according to the circumstances of each commodity. Pig iron and ore can always be loaded to 110 per cent. of the capacity of the car. Coal loaded in open cars should be put in to fill the car; bituminous should be heaped, but with anthracite this does not pay, as considerable coal will be lost off. Each railroad should number its cars so that the number will indicate the dimensions and capacity of the car. Lumber in large orders can be loaded to the full capacity of cars, but where an order is for just enough lumber to make a certain house or barn there is no

of freight blockade is the low water in the rivers. Shipments have been delayed in hopes that the cheap water transportation might yet become available, and when no further delay is possible and the railroads are crowded with other freight, the river and canal freight is brought to them.

The number of Mahometans in Russia is so great that the railroads have joined with steamer lines which ply between the Black Sea and the Eastern Mediterranean in issuing through tickets from Russian stations where there are many Mahometan pilgrims to Mecca, who take ship at Sebastopol going, but are landed on their return at another port nearby. These tickets are good for nine months.

A Testing Machine for Full Size Structural Members.*

The universal testing machine shown in the accompanying illustration is made by J. Buckton & Company, Limited, Leeds, England. This machine was made for testing full size structural members and it has a capacity of 300 tons in compression, tension, deflection and shearing. It will test columns 88 ft. long and 3 ft. 3 in. square. The machine consists essentially of three parts; the mechanism which applies the load, the ap-



300-Ton Universal Testing Machine.

use in trying to get the car fully loaded, unless that order fills it. Records of 200 cars of lumber arriving at a certain station showed an average of 19 tons; 20-ton cars averaged 18 tons; 40-ton cars averaged 21.5 tons. Many freight tariffs are found to discourage the loading of lumber to the full capacity of some cars.

Foreign Railroad Notes.

The signs of a "car famine" on German railroads increase, after two years of pretty satisfactory supply of all demands. This usually sets in during the sugar-beet harvest, which makes great demands for short hauls for some weeks in the fall, just at the time people are laying in their winter's supply of coal. This year a special cause

paratus which measures it and the frame or bed. The two advantages of this machine which make it differ from others is that the frame or bed instead of being fixed as in the ordinary machine, is movable, and that the weighing levers contrary to the general arrangement with fixed beds, are at the same end as the straining cylinder. The levers are mounted on the stationary cylinder instead of being carried on the moving ram. Owing to the above combinations the machine possesses facilities for testing a variety of sizes and for testing either in compression or tension, without being rearranged. The hydraulic ram is between the trough at the far end of the machine and is connected to a straining frame and crosshead, which in turn is connected to the balancing system which floats upon rollers, and nowhere touches the sliding trough. From the balance the load is delivered to the steel yard at the far end of the machine.

The straining frame is both surrounded and traversed by a balancing frame. The result is that the straining crosshead can push on to one part of the balancing frame and pull on to another part, and the straining crosshead can itself be run along the straining frame into a position for pulling or pushing either long or short pieces.

The machine is also fitted with a complete apparatus for making autographic records.

*From a paper by J. H. Wicksteed, read before Section G of the British Association, Cambridge meeting.

| *SOUTHERN PACIFIC CO. RECORD OF HOME CARS. | | | | | | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Car. | 6201 | | | | 6202 | | | | 6203 | | | | 6204 | | | |
| Month. | Jan. | Feb. | Mar. | Apr. | Jan. | Feb. | Mar. | Apr. | Jan. | Feb. | Mar. | Apr. | Jan. | Feb. | Mar. | Apr. |
| Transfer. | | | | | | | | | | | | | | | | |
| Date. 1..... | | | | | | | | | | | | | | | | |
| 2..... | | | | | | | | | | | | | | | | |
| 3..... | | | | | | | | | | | | | | | | |

GENERAL NEWS SECTION

THE SCRAP HEAP.

The Mexican Railway and the Inter-oceanic of Mexico have decided to abolish the use of round trip tickets because so many of them get into the hands of scalpers.

On the New York, New Haven & Hartford an order has been issued forbidding the sale (by news dealers) of cigars and cigarettes in the passenger stations.

Along the line of the Pennsylvania Railroad west of Harrisburg there is a drought so severe that at 20 or more places temporary engines have had to be put in to pump water from streams to supply the locomotives.

The widow of Mr. S. M. Ga Nun, who was killed in the rear collision in the Fourth avenue tunnel, New York City, Jan. 8, 1902, has recovered a verdict of \$35,000 against the railroad company in the Supreme Court of New York. Mr. Ga Nun died 18 months after the collision. He was 51 years old and had an income of more than \$10,000 a year.

The report of Inspector Duval on a recent collision on the Grand Trunk at Eastwood, Ont., in which five persons were killed, is to the effect that it was caused by overwork on the part of the brakeman and conductor, both of whom had been on continuous duty for 32 hours. These men were responsible for not setting a switch after letting their train into the siding. Both men were killed in the collision.

A circular issued by the Transcontinental Passenger Association giving the results of the handling of the tickets sold in connection with the conventions of the Knights Templar and Odd Fellows at San Francisco in September, shows that 21,000 tickets were validated, representing a revenue to the railroads of at least \$1,050,000. The effective work of the bureau is shown in the statement that 120 tickets were confiscated by the joint agencies and 95 were confiscated on trains.

When the new power interlocking of the Long Island Railroad at Long Island City was put in use on Monday of last week the men who had been trained to handle the machine proved unable to carry out the movements with the necessary celerity, and trains were badly delayed for several days; and the company finally had to restore individual switch working, putting a man at each switch or crossover, as was the practice during the time that the interlocking was being put in. The new levermen had had six weeks' training, but when the test came they seemed, in the language of one of the officers of the road, to have "lost their confidence"; and, as the number of train movements at this terminal is very large, the slight delays occasioned by the men's inexperience soon amounted in the aggregate to hours, for many of the trains, and thousands of suburban passengers were compelled to take street cars to reach their homes. It appears that in addition to other difficulties it was found that the yard was insufficiently lighted at night. It was also found that switching movements could be facilitated by a few changes in schedules, and it is understood that these changes are to be made. This interlocking machine is the second largest in the world.

The New York Subway.

The principal items of news gathered by the New York City reporters concerning the subway during the past two weeks are, first, that the daily average of passengers carried (225,000) does not cause any appreciable decrease in the number of passengers during the rush hours on the elevated trains; and, second, that the increase of transportation facilities between the Brooklyn Bridge terminus and "up-town" has made the crush at the bridge about five o'clock in the evening worse than ever before. It is said that the average daily number of passengers carried on the elevated trains now is about one million. This is double the daily number carried a few years ago. The increase is accounted for partly by the extension of the line northward to Bronx Park, and partly by the increase in the carrying capacity in the trains since the adoption of electric motive power. Six-car trains have now been run for about two years, and within the last few weeks many seven-car trains have been run. The daily number of passengers now carried is said to be 75,000 less than before the opening of the subway, but, as before stated, this makes no appreciable diminution of the crowds during the heaviest hours morning and evening. It is now expected that the east side branch of the subway will be opened as far as the Harlem river on November 27.

Double Tracking the Siberian Railroad.

A press despatch from St. Petersburg this week says that the Emperor has approved the plan for double-tracking the railroad through Siberia, and that \$5,000,000 has been appropriated to begin the work. The newspapers express hearty approval and hope that the work will be begun at once, believing it to be one of the surest means of ending the war; which, in view of the magnitude of the railroad project, seems like a willingness to swap horses in the middle of the stream.

Pig Iron Production for October.

The *Iron Age* shows for October total pig iron production of 1,448,973 tons, as against 1,352,677 tons in September, 1,167,672 tons in August, and 1,106,297 tons in July. The October production of pig by the steel companies was 971,447 tons, which compares with 936,494 tons in September, 747,570 tons in August, 694,892 tons in July, and 788,822 tons in June. The number of stacks in blast on November 1 was 194, as against 190 on October 1, and the weekly capacity on November 1 was 334,249 tons, as against 319,946 tons on October 1.

Disastrous Collision at Azusa, Wyoming.

On the morning of November 12 a butting collision between westbound passenger train No. 3 and an eastbound freight, on the Union Pacific, a short distance west of Azusa, Wyo., resulted in the death of nine employees and four passengers and the injury of 10 or more other persons. It is said that the freight train had received an order to use 50 minutes on the time of the passenger train, and that the order delivered to the passenger train read 30 minutes.

New Stations on the B. & O.

The Baltimore & Ohio announces that its station buildings are going to be made more respectable. In the last seven years the

company has spent over a hundred millions in reducing grades, taking out curves and building freight terminals, and President Murray has decided that the time has come to improve the stations. An order has been issued for the building of 33 stations at places where box cars and old buildings are now being used. Much of this work will be done during the winter. Some larger station propositions, ranging from \$50,000 to \$100,000, are under contemplation for spring work.

American Forest Congress.

An American Forest Congress under the auspices of the American Forestry Association will meet in Washington, D. C., January 2, 3, 4, 5 and 6, 1905, for the purpose of advancing the conservative use of forest resources and to secure a united effort to perpetuate the forests of the country. The subjects to be considered are: "Relation of the Public Forest Lands to Irrigation, to Grazing and to Mining"; "Lumber Industry in the Forest," "Forestry in Relation to Railroad Supplies," "National Forest Policy," and "State Forest Policy." The President of the Congress is Hon. James Wilson, Secretary of Agriculture, and among the members of the Committee of Arrangements are Mr. Cassatt, President of the Pennsylvania; Mr. Elliott, President of the Northern Pacific, and Messrs. Pinchot, von Schrenk, and other officers of the Forestry Department at Washington. William L. Hall is Secretary, Atlantic building, Washington, D. C.

Fast Runs.

On Monday, November 14, westbound fast mail train No. 11 of the Pennsylvania Railroad was run from Harrisburg to Altoona, 132 miles, in 132 minutes. This train usually consists of three mail cars, weighing about 160 tons. An equally good run was made on September 19, so that that made this week is not a "record breaker," as has been said in the newspapers.

On Friday, November 11, a special train was run over the Pennsylvania Lines from Crestline, Ohio, to Fort Wayne, Ind., 131.4 miles, in 113 minutes, equal to 69.8 miles an hour. The train consisted of Atlantic type engine No. 7,166, weighing, with tender, 163.5 tons, and three cars. From Crestline to Clarke Junction, 257.4 miles, the time was 245 minutes, making the rate of speed 63 miles an hour. Excluding stops it was 64.9 m.p.h.

Compulsory Block Signaling.

The railroad accident record for the year has been a bad one. Casualties have reached the appalling aggregate this year of 54,937, which is 6,000 greater than the losses from three days' fighting at Gettysburg. It is a record which is humiliating to railroad men whether officers or employees. The public will not lie back in impotence and consent to the repetition indefinitely of the record which the railroads have been making in the past few years. Last year the Interstate Commerce Commission made a recommendation to Congress that a law be passed compelling railroads to block signal their lines on a schedule of installments that would give them until 1909 to complete the work. The feeling among railroad managers to-day is that some action is certain to be taken at the next session of Congress. The attitude towards the agitation taken by rail-

road men is not always the same. Where railroads have not been equipped with the safety appliances which advanced practice calls for, the fault generally lies not with the manager but with his directors who have failed to act upon his best judgment. Some managers who deprecate the necessity of public intrusion in the administrative affairs of the railroad would be disposed favorably toward Congressional action because such action would give weight to their recommendations to their directorates.

Whenever the legislative body undertakes to prescribe formulae of safety or enters specifically into the administrative affairs of a concern conducted under private auspices, there is always danger of mistakes being made. The policy of the government hitherto has been largely to lodge the responsibility for neglect against the corporation and leave it to its own devices in making proper precautions. Yet, it must be admitted that the law requiring automatic couplers and air-brakes on cars has worked well.—*Wall Street Journal*.

G. P. A. of a New Breed.

The Boston & Northern and the Old Colony street railroads of Massachusetts have combined in the establishment of a passenger agency, and the office of the passenger agent is at 309 Washington street, as big as life—that is to say, as imposing as the numerous passenger offices of the steam railroads which are to be found in that locality. The passenger agent is Mr. Robert H. Derrah, long known as an enterprising promoter of excursions, amusement resorts, and other things by which city and interurban electric railroads stimulate their business. Mr. Derrah was the first man to work up interest in trolley trips from Boston to New York, and he has done much to promote business at seashore resorts north and south of Boston. The railroads which he now represents extend from Nashua, N. H., to Newport, R. I.; they operate 800 miles and connect 22 cities which, with the intermediate towns, have a population of over two millions.

Rebates to the "Trusts."

The Interstate Commerce Commission, in an opinion by Commissioner Prouty, has given its decision on "Divisions of Joint Rates and Other Allowances to Terminal Railroads." This decision refers to terminal roads in or near Chicago connecting the plants of the International Harvester Company and the United States Steel Corporation (popularly known, respectively, as the Harvester Trust and the Steel Trust) with roads leading to all sections of the country. The Commission holds that it is unlawful for any carrier to grant excessive divisions of rates to another carrier owned by a shipper, for the purpose of securing the traffic of that shipper, and that to the extent such divisions of rates exceed a reasonable charge for the service performed they operate as a rebate for the benefit of the shipper, and constitute undue preference.

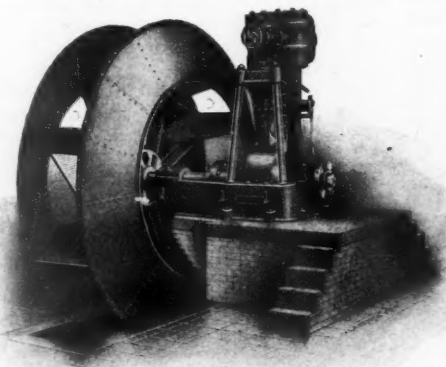
The International Harvester Company owns the capital stock of the Illinois Northern Railroad and a controlling interest in the Chicago, West Pullman & Southern. Until recently these terminal roads received a switching charge of \$1.00 to \$3.50 per car, but they now receive in many instances a division of the rate, which on lines reaching the Missouri River is 20 per cent., with the Missouri River division as the maximum. This amounts, on farm machinery, to \$12 a car as against the former maximum of \$3.50. A charge of \$3.50 per car by the Illinois Northern and of \$3.00 per car by the Chicago, West Pullman & Southern would be reasonable for these switching services, and charges

for such services in excess of those sums amount to unlawful preference in favor of the International Harvester Company.

The Chicago, Lake Shore & Eastern Railway Company, owned by the United States Steel Corporation, receives a division of 10 per cent. of the rate to the seaboard; 15 per cent. to Buffalo and Pittsburg, and 20 per cent. to the Missouri River. These divisions are found to be grossly excessive for the service rendered and to afford unlawful preference to the United States Steel Corporation, which owns and controls the Illinois Steel Company.

A New Type of Induced Draft Fan.

The accompanying illustration shows the latest type of fan wheel of the American Blower Company, Detroit, Mich. The spider is formed of angle irons which are much stronger than a double set of T arms, which is usually employed. Every blade is braced with bar iron braces from the outer rim to the center, which overcomes twisting. In the side of the fan housing is a deep cone which extends close to the hub. A special heavy cantilever arm carries the inner bearing, which is water-jacketed. The distance



from the end of the apex to the end of the projecting shaft seldom exceeds 1 ft. It is not always customary to make an extension of the base of the engine, as shown in the illustration. In some cases an I beam grille is built into the brick foundation, the engine being set on top of the outer ends of these beams and anchored. Two large units of the character shown in the figure have been furnished the Wilkesbarre & Wyoming Valley Traction Company, Wilkesbarre, Pa., for induced draft in the power house. These wheels are encased in a three-quarter steel plate housing, the wheels being 11 ft. in diameter and driven by 12-in. x 10-in. vertical engines.

Railroads in Spain.

The traffic receipts of the different railroad companies for the year 1903 show a satisfactory improvement. The North of Spain and the Madrid-Zaragoza-Alicante companies, the two most important railroads in Spain, have increased their receipts by 20 per cent. since 1898; the South of Spain Company has increased its receipts 22 per cent.; the Caceres-Portugal Railroad, 33 per cent., and the "Andaluces" Company, 9.79 per cent. Steady progress is being made in improving the existing main lines; tracks are being doubled in the sections where the increasing traffic requires it, and the antiquated rolling stock is being replaced by modern cars and locomotives. During the year 1903, 155 miles of main line were opened for traffic. Negotiations are in progress for bringing into effect the agreement made by France and Spain in 1885 to build two new railroads through the Pyrenees. An international committee has been named to

study the several routes proposed. The most likely of these routes is from Ax-les-Thermes, in the Department of Ariège, across the high plateaux of the Cerdana, to Puigcerdá, Spain, and thence to a terminal at Ripoll, where a junction would be made with the present railroad line from Barcelona. The preliminary surveys for this route have already been made. Of the various laws passed during the last session of the Cortes, there was one relating to "secondary" railroads. These are intended to complete and develop the existing systems, and by passing through districts now comparatively unproductive will open them up to agricultural, mining, and industrial enterprise. The new law considers this class of railroads to be for the public good, and therefore exempts them, during the first few years of their working, from the usual tax on their passenger and freight traffic, and allows them, by special concession, to make use of any public works belonging to the State or other public bodies. The total length of track authorized is about 3,125 miles, which is to be divided into groups or systems of about 125 miles each. The State will guarantee during 20 years, commencing

on the first of the month following the inauguration of the line, a minimum interest of 4 per cent. per annum on the capital cost of the line, exclusive of the rolling stock. The maximum amount of capital that the State will guarantee interest on must not exceed \$7,140 per kilometer. The concessions for each of the various groups of these light railroads will be granted by the Government to the highest bidder at public "auction," which will be held in due time, but the provincial councils, or other local authorities, will have the first right to these concessions, on condition that such local authorities take over entirely or in part the guaranty offered by the State.—*Consular Report*.

Anthracite Shipments for October.

The Philadelphia & Reading's shipments of anthracite coal for October were the largest ever made by the company in one month and were equal to 22½ per cent. of the total amount of anthracite coal sent to the market. The total tonnage of all railroads for the month was 5,131,542 tons as compared with 3,925,642 tons in October, 1903. The total shipments of anthracite for the first ten months of this year were 47,305,310 tons, as against 51,011,735 in the corresponding period of 1903. The *Wall Street Journal* gives the following table showing the percentages carried by the various railroads.

| | Allotment. | Per ct. of shipments to | |
|------------------------|------------|-------------------------|----------|
| | | June 30. | Oct. 31. |
| P. & R. | 20.50 | 19.38 | 19.72 |
| Lehigh Valley | 15.65 | 16.49 | 16.52 |
| C. R. R. of N. J. | 11.70 | 12.64 | 12.66 |
| D. L. & W. | 13.35 | 16.08 | 16.22 |
| D. & H. | 9.60 | 9.95 | 9.22 |
| Penna. | 11.40 | 8.11 | 8.33 |
| Erie | 11.20 | 10.28 | 9.98 |
| O. & W. | 3.10 | 4.55 | 4.59 |
| D. S. & S. | 3.50 | 2.52 | 2.71 |

The New York State Barge Canal.

The Advisory Board of Engineers which was appointed to prepare estimates and specifications for improving the Erie, Oswego and Champlain canals has completed the specifications for the first six sections of the work, and bids will be advertised for as soon as the Attorney-General approves the form of bond to accompany the contracts.

The board consists of Colonel A. B. Fry, Chief Engineer in the United States Treasury service; Colonel A. T. Symons, United

States Army; Dr. E. C. Corthell, Edward A. Bond, ex-State Engineer, and William A. Brackenridge.

In preparing the specifications for this first part of the work six sections typical of the whole improvement were selected, and the engineers say that the result shows that the entire improvement can be accomplished within the amount of \$101,000,000 appropriated for the purpose by the act of 1903. On section 2, nine-tenths of a mile long, the work will cost over \$1,000,000. Only on one section of the six in question has the board exceeded the original estimate made by the Board of Public Works. The advertisement calling for bids will be published for four weeks, but the engineers think that work can be begun this winter. —*Journal of Commerce.*

A National Electric Plant in California.

The plant of the Monterey County Gas & Electric Company, Monterey, Cal., which has been newly installed by the National Electric Company, Milwaukee, Wis., constituted the exhibit, at the eighth annual convention of the Pacific Coast Electric Transmission Association held in Monterey in June, of Kilbourne & Clark Company, Pacific Coast agents. The installation includes a 200-k.w. generator and a motor-generator set, the latter consisting of a 162-k.w. synchronous revolving-field motor direct-connected to a National 550-volt, direct-current, 150-k.w. railway generator.

The 200-k.w. a.c. generator is of the revolving-field type and is belt-driven. It is a 12-pole, 60-cycle machine, running at 600 r.p.m., and weighs 12,850 lbs. Its inherent regulation is within 6 per cent. at unity power factor. Its temperature results have been better than the guarantee of a rise not to exceed 35 deg. C. under a continuous 24-hour run at full normal load. The actual rise was only 22 deg. It has run for considerable periods with a 50 per cent. overload without serious heating. The efficiencies of the generator are, 93 per cent. at 25 per cent. overload; 92.5 per cent. at full load; 91.25 per cent. at three-quarter load; and 88 per cent. at half load. The exciter is 12 k.w. at 110 volts and 1,450 r.p.m., and is belt driven. The motor-generator set runs at 720 r.p.m.

A 22-in. pulley has been placed on the shaft between the motor and generator, and is belted to the fly-wheel of a 200-h.p. high-speed Buckeye engine. The object of this is that during the hours of light load both units of the set may be run as generators, and it also makes of the motor-generator set a link by means of which the railroad load may be coupled in with the two-phase load, or vice versa. This enables a day alternating current service to be maintained in conjunction with the railroad load, at maximum efficiency in operation. The installation of the motor-generator set may appear anomalous in view of the fact that the current for its operation is taken from generators located within the same premises, but the builders considered it to be the most satisfactory solution of the problems presented by local conditions.

Manufacturing and Business.

The Buckeye Jack Manufacturing Co., Louisville, Ohio, has made a shipment of its jacks to Rio de Janeiro, Brazil.

The Nelson Machine & Supply Co. has been incorporated in New York with a capital of \$25,000 to sell engines, etc., by W. J. Burke, G. C. Penbloss and J. J. Blaine, all of New York.

The Greene Supply Co. has been incorporated in Newark, N. J., with a capital of \$50,000 by Henry H. Greene, of New York; Isaac

Anderson, of Buffalo, and Samuel W. Boardman, of Newark, N. J.

The American Frog & Switch Company, of Hamilton, Ohio, has been awarded the highest prize, a gold medal, for its exhibit at the St. Louis Exposition.

The London & North Western's exhibit at the St. Louis World's Fair, consisting of models of cars, specimen section of actual track, etc., received the highest award for general excellence.

The American Water Softening Co., of Philadelphia, has moved into a larger office and is now in the Mutual Life Building, 1011 Chestnut street. The laboratory is combined with the general sales department.

The Peerless Motor Car Co. has been incorporated in New York with a capital of \$50,000 to make motor engines, etc. The directors are: C. G. Wridgway, C. E. Anderson, of New York, and L. H. Kittredge, of Cleveland, Ohio.

The Sauvage Safety Brake Co., of 15 Exchange place, Jersey City, has been incorporated in New Jersey to make railroad brakes and other appliances with a capital stock of \$300,000 by A. Barker, S. Smith, C. L. Jones and Wm. C. Cudlipp.

The New York Continental Jewell Filtration Co. reports the recent sale of four filters with a capacity of 2,000,000 gallons to the Municipal Water Works at Norwich, N. Y., and miscellaneous orders for about 30 filters from factories, houses, etc.

The Philadelphia & Reading, according to reports, has given a contract to the American Car & Foundry Co. for four car floats (each to carry eight cars) for use on the Delaware river. The company has at present in service in Philadelphia about 24 floats.

The Northern Engineering Works, Detroit, Mich., report recent shipments of cranes as follows: Bethlehem Foundry & Machine Co., four-ton electric crane, 43 ft. span; Public Service Corporation of New Jersey, 10-ton, 39 ft. span, and to the Union Metallic Cart-ridge Co., 12-ton, 50 ft. span.

Mr. S. J. Bowling, formerly President of the C. B. Hutchins & Sons, of Detroit, has become associated with the Philip Carey Manufacturing Company, of Lockland, Ohio. Mr. Bowling has been appointed Manager of the Freight Car Roofing Department of the company, with headquarters at 17 Jefferson avenue, Detroit.

The London (Ont.) Machine Tool Co. is shipping to Moncton, N. B., a large iron-working planer for the Intercolonial Railway. It has four cutting heads, capable of removing a total of 15 tons of iron planings a day. It is 40 ft. long, 12 ft. high and 10 ft. wide. It weighs 120,000 pounds and will be used for planing locomotive frames.

J. W. Duntley, President of the Chicago Pneumatic Tool Company, is in Europe on a brief business trip. He expects to start the new plant at Fraserburgh, Scotland, and to visit the business centers of Great Britain and the Continent. He has with him samples of the "Duntley" electric drills with which demonstrations will be made. The company reports October sales almost double those of any other month for the past two years.

The Falls Hollow Staybolt Company, Cuyahoga Falls, Ohio, has recently received an order from the Kiushiu Ry. Co. of Japan, for upwards of 50,000 lbs. of Falls hollow round bars. Large quantities of hollow bars are also being shipped to other railroads of Japan and the Japanese Government. The company state that the Norwegian State Ry.

Co. are now using Falls hollow iron exclusively for staying the fire-boxes of its locomotives.

The Barker Mail Crane Company, Clinton, Iowa, reports that it has its cranes in actual operation on 15 roads, the numbers for the different roads varying from two to 30. Second orders have been received from the Illinois Central, Northern Pacific, Bangor & Aroostook, and New York, Ontario & Western, and a second and third order from the Lake Shore & Michigan Southern.

The Elliot Frog & Switch Co., of East St. Louis, Ill., has been awarded a gold medal on its exhibit at the Louisiana Purchase Exposition. This company makes track appliances for electric and interurban lines, but this exhibit was confined to steam railroad appliances; the "Eureka" spring rail frog, the improved sliding frog for use in yards, which gives a continuous rail on both tracks, and split switches showing improvements in adjustable features. There were also rigid frogs, switch stands and the "hasty three throw split switch."

The Allis-Chalmers Company announces that W. A. Nelson has been appointed Superintendent of Equipment. He was until recently Assistant Superintendent of the Westinghouse Electric & Manufacturing Company. R. C. Wright has taken a position in the Milwaukee Works. Mr. Wright was for several years at the East Pittsburg Works of the Westinghouse Machine Company. Charles F. Barth has been appointed Foreman of the steam turbine department at the West Allis Works, and C. A. Derby has resigned as Assistant Manager of the Lyon Cypress Lumber Company to enter the saw mill department of the Allis-Chalmers Co.

The Consolidated Car-Heating Company has just received an order from the Interborough Rapid Transit Company for electric heaters for 100 steel cars. This is in addition to former orders for electric heaters for equipping 700 cars for use in the subway. This company also recently shipped to the Pullman Company's works hot water drum equipments for 18 combination smoking-observation cars for the Southern Pacific Company, which equipments are covered by the Consolidated Car-Heating Company's contract with the Harriman lines for all of their steam heat material, and to the Union Pacific 1,200 of its new automatic locks for use on steam couplers, also a number of these locks to other roads of the Harriman system.

Iron and Steel.

The plant of the Chicago Steel Manufacturing Co. at Newcastle, Ind., is reported to have been damaged by fire November 8; loss about \$100,000.

According to reports from Youngstown, the Bessemer Pig Iron Association has sold to the Jones & Laughlin, the Lackawanna Steel Co. and the Youngstown Iron, Sheet & Tube Co. about 50,000 tons of Bessemer iron.

The Carnegie Tube Co. tube works at Carnegie, Pa., which has been closed for nearly two years, has been leased to the A. M. Byers Company of Pittsburg. The works will be placed in operation at once, giving employment to about 500 men.

The Dominion Government, it is reported, has awarded a second contract for 10,000 tons of rails to the Consolidated Lake Superior Co. for use on the Intercolonial Railway. It is also reported that the company has an order for 40,000 tons from the Canadian Pacific Railroad.

Joel Farist, founder and President of the Farist Steel Company, of Bridgeport, Conn.,

died November 12, at the age of 72 years. Mr. Farist was the founder and the President of the Bridgeport Crucible Co., and formerly made gun barrel and bayonet steel for the United States Government at Windsor Locks, Conn.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 24.)

Richmond Railroad Club.

At the annual meeting of this club in Richmond, Va., November 10, a paper on "Railroad Claims" was read by Mr. E. H. Lea, Agent of the Southern Railway. The following officers were elected: W. H. Owen, President (So. Ry.); W. F. Kapp, First Vice-President (R. F. & P.); J. S. Chambers, Second Vice-President (S. A. L.); E. H. Lea, Third Vice-President (So. Ry.); F. O. Robinson, Treasurer. The executive committee will consist of E. T. D. Myers, George W. Stevens and R. P. C. Sanderson. The report of the treasurer shows a membership of 261; cash on hand, \$1,325.

PERSONAL.

—Mr. J. D. Farrell, of Seattle, Wash., Assistant to the President of the Great Northern, died on Friday, November 11, from blood poisoning.

—Mr. W. White, who a few weeks ago resigned as Master Mechanic of the Lake Erie & Western, is now connected with the Chicago Pneumatic Tool Company at its New York office, 95 Liberty street.

—Mr. J. R. Bowie, who until recently was Foreman of the Car Shops of the Pennsylvania Railroad at Columbia, Pa., has taken a position with Pepper & Register, Engineers and Contractors of Philadelphia. Mr. Bowie's office will be at Wallace, Cal.

—Mr. A. M. Mozier, Superintendent of Transportation of the New York, Susquehanna & Western (Erie), died recently while traveling in Europe, where he had gone for his health. Mr. Mozier was for many years an officer of the operating department of the Erie, having been long Superintendent in Ohio.

—Mr. Charles A. Parker, Vice-President of the Cincinnati, Hamilton & Dayton, and Vice-President of the Pere Marquette, in charge of traffic, dropped dead in his office at Cincinnati on November 16. Mr. Parker went to Cincinnati a few weeks ago, shortly after the union of these two railroads. He was formerly Traffic Manager of the Colorado Fuel & Iron Company, and was about 48 years old.

—Mr. Albert A. Sharp, of Memphis, formerly and for a number of years Superintendent of the Louisville, New Orleans & Texas (Yazoo & Mississippi Valley), died on November 3, at the age of 60. He continued in charge of transportation until the merging of the Y. & M. V., with the Illinois Central, at which time the road was divided into two divisions, the Memphis Division and the New Orleans Division. Mr. Sharp then took charge of the Memphis Division. About two years ago he retired from railroad service.

—Mr. H. S. Hunter, who on the first of this month became Master Mechanic of the Philadelphia & Reading at Reading, began his railroad work as an office boy in the office of the Superintendent of Motive Power at the age of 14. In 1873 he was a machinist apprentice and has been successively machinist, shifting brakeman, yard and road

fireman, engineman, assistant road foreman of engines, road foreman of engines, and in 1899 was transferred to the Reading Division in a similar capacity, from which position he was promoted as above.

—Mr. J. A. McRae, the new Mechanical Engineer of the Boston & Albany, is a graduate of the University of Illinois, and has been in railroad service for the past seven years. He began as a draftsman on the Chicago & North Western in 1897. Two years later (1899) he resigned and took a similar



position on the New York Central & Hudson River. Later he worked on locomotive tests and also did special work. In June last he went to the Boston & Albany, and is now promoted to be Mechanical Engineer at Boston.

—Mr. Joseph A. Gordon, who succeeds Mr. Turner as General Superintendent of the Cincinnati, Hamilton & Dayton, was born in Cincinnati 39 years ago. Mr. Gordon graduated from Saint Xavier College, Cincinnati, class of 1884. He began his railroad career as a telegraph operator in that year and worked as an operator and clerk in the local freight office until 1887. After spending



about a year in Europe, Mr. Gordon re-entered the service of the Cincinnati, Hamilton & Dayton as a clerk in the auditing department. Later he was made station agent, and in 1890 was appointed clerk to the Superintendent of the Cincinnati Division. In 1893 he was made Trainmaster, and three years later was promoted to be Superintendent of the Wellston Division. In May, 1902, he was transferred to the Superintendency of the Southern Division, and on the first of this month was again promoted

to the General Superintendency. In June last he was elected President of the Central Association of Railroad Officers.

—Mr. Moritz Reinhold Sahlander, heretofore General Manager of Telegraphs, has been appointed General Manager of the Swedish State Railroads, in place of C. F. Th. Nordström, who has become Governor of one of the political divisions of Sweden. Mr. Sahlander is in his 45th year, educated as a jurist, and in the State service since 1888, in the postoffice and telegraph departments.

—Mr. Walter H. Barnes, for many years General Manager of the Boston & Albany, died at his home in Brookline Hills, Mass., on November 14, at the age of 70. Mr. Barnes had been in railroad service since 1855, his entire service being on the Boston & Albany, and its predecessor, the Boston & Worcester. He was born in Worcester, Mass., and began as a delivery clerk in the local freight office at Worcester. He was steadily promoted through the various grades until 1882, when he was appointed General Superintendent. Five years later he was promoted to be General Manager, from which position he resigned last March.

—Mr. Edward J. Martin, who for the past 11 years had been General Freight and Passenger Agent of the San Antonio & Aransas Pass, at San Antonio, Texas, died recently in that city, at the age of 54. Mr. Martin was a native of Louisville, Ky., and had been in railroad service since 1874, when he began as a cashier for the Southern Pacific at San Francisco. Then for a time he was a clerk in the office of the Superintendent and in 1879 was appointed Assistant General Freight Agent of the Pacific System. In May, 1893, he was appointed General Freight and Passenger Agent of the San Antonio & Aransas Pass, which position he held at the time of his death.

—Mr. C. F. Thomas, a well-known Master Mechanic, died in Albuquerque, N. Mex., on October 25. Mr. Thomas entered the Pennsylvania Railroad shops at Renova, Pa., as an apprentice in 1875, and after serving his apprenticeship, he took a position on the Mobile & Montgomery. In 1880 he entered the service of the Louisville & Nashville as General Foreman at Nashville, Tenn. In 1883 he went to the Chesapeake & Ohio as General Foreman at Hinton, W. Va., and in 1884 was made Master Mechanic of the Richmond Division. He left the service of that company and took a similar position on the Georgia Division of the East Tennessee, Virginia & Georgia at Atlanta, Ga. In 1890 he was Master Mechanic of the Central of Georgia at Macon, then Master Mechanic on the Richmond & Danville at Alexandria, then on the Southern at Columbia, S. C., and in 1902 went to the American Locomotive Company as General Inspector at the Richmond Works. In 1904 he went to the Baldwin Locomotive Works, where he did special work in California and New Mexico, in which he was engaged at the time of his death. Mr. Thomas was a member of the Master Mechanics' Association and the Master Car Builders' Association and did efficient work on a number of committees. He was studious and enterprising and had designed many improvements on "shop kinks" now in use. Mr. Thomas was honest and unselfish and is mourned by a large circle of friends.

—Mr. Christian Smith, who was the engineman of the first steam engine ever run over the Baltimore & Ohio Railroad, died at his home near Sandy Hook, Washington County, Maryland, on November 5, at the age of 93. Mr. Smith began work on the

Baltimore & Ohio in December, 1832, as a teamster, driving the horses of a train between Plane No. 4 and Frederick. The cars at that time were hauled entirely by horses except on the steep inclines where stationary engines were used. When locomotives were brought into use Mr. Smith became a fireman and subsequently was engineman, mechanic, conductor, trainmaster, despatcher, ticket agent and passenger agent. During the war of the Rebellion the Baltimore & Ohio was more severely taxed than, probably, any other railroad in the country, and Mr. Smith served throughout that trying four years. He retired from railroad service in 1873. The first engine run by Mr. Smith weighed less than 13 tons. As a way of showing in a striking manner the short span of the railroad era up to the present time, the officers of the Baltimore & Ohio had invited Mr. Smith to take the throttle on the mammoth Mallet compound locomotive recently built for the company and now at the World's Fair; but the engine has not yet been brought back from St. Louis and so Mr. Smith did not live to carry out this arrangement. The Mallet engine weighs 334,500 lbs., or more than 13 times as much as the engines of Mr. Smith's time.

ELECTIONS AND APPOINTMENTS.

Buffalo, Rochester & Pittsburgh.—F. T. Hyndman, Superintendent of Motive Power, has resigned. (See New York, New Haven & Hartford.)

Canadian Pacific.—C. B. Foster has been appointed Acting Assistant General Passenger Agent of the Ontario Division, with office at Toronto, Ont., succeeding A. H. Notman, who has, on account of ill health, been granted a few months leave of absence.

Chicago, Rock Island & Pacific.—James Speyer has been elected a Director.

Interborough Rapid Transit Company (New York).—George Keegan has been appointed Assistant to the General Manager.

Lake Shore & Michigan Southern.—Joseph Chidley has been appointed Assistant Master Mechanic of the Michigan Southern Division, with headquarters at Elkhart, Ind., succeeding Peter Maher, resigned.

Lehigh Valley.—J. A. Middleton, hitherto Second Vice-President, has been elected First Vice-President, with office at New York City. J. W. Platten, hitherto Assistant to the President, has been elected Second Vice-President.

Long Island.—J. Stanley Brown, Assistant to the President, has resigned.

Mexican Central.—H. Lawton, hitherto General Freight Agent, has been appointed Freight Traffic Manager. W. D. Murdock, hitherto General Passenger Agent, has been appointed Passenger Traffic Manager.

Missouri, Kansas & Texas.—P. N. Edgett has been appointed Superintendent of Dining Service, with office at Smithville, Texas.

New York Central & Hudson River.—The office of Assistant General Eastern Passenger Agent has been abolished and Vernon V. Beard has been appointed Eastern Passenger Agent.

New York, New Haven & Hartford.—F. T. Hyndman, hitherto Superintendent of Motive Power of the Buffalo, Rochester & Pittsburgh, has been appointed General Master Mechanic of the N. Y., N. H. & H., with headquarters at New Haven, Conn., succeeding F. B. Smith. Effective to-day.

Pere Marquette.—W. S. Carson has been appointed Superintendent of Terminals at Saginaw, Mich.

St. Louis & San Francisco.—C. R. Gray, General Manager, has been appointed Second

Vice-President, succeeding R. R. Hammond.

St. Louis, Iron Mountain & Southern.—J. F. Harnit has been appointed Superintendent, with headquarters at Van Buren, Ark., succeeding J. D. Moore, assigned to other duties.

Southern Indiana.—E. H. Pfaffin, hitherto Superintendent and Chief Engineer of the Evansville & Terre Haute, has taken a position as Engineer of Maintenance of Way and Structures of the Chicago Southern, an extension of the S. I., from the State line to Chicago, about 112 miles.

Western Maryland.—Winslow S. Pierce has been elected President, succeeding Joseph Ramsey, Jr.

LOCOMOTIVE BUILDING.

The Apex Equipment Co., 11 Broadway, New York, is in the market for one 18-20 tons connected locomotive.

The Chicago & Eastern Illinois has ordered six switching (0-6-0) engines and six simple consolidation (2-8-0) locomotives from the American Locomotive Co.

The Kiushui Railway, Japan, has ordered 12 mogul (2-6-0) locomotives from the American Locomotive Co. These locomotives will be duplicates of the ones which were ordered by the same railroad earlier in the year and which were on exhibition at St. Louis in the exhibit of the American Locomotive Co.

CAR BUILDING.

The Duluth & Iron Range is asking prices on 300 gondola cars.

The Intercolonial has ordered two dining cars from the Pullman Co.

The Maine Central is having 50 freight cars built by the Laconia Car Co.

The American Car & Foundry Company has miscellaneous orders for 202 cars.

The Duluth, Missabe & Northern is asking prices on 800 gondola cars of 100,000 lbs. capacity.

The General Chemical Company, New York, has ordered 20 tank cars from the Bettendorf Axle Co.

The Minneapolis, St. Paul & Sault Ste. Marie is having 14 passenger coaches built by Barney & Smith.

The Chicago, Burlington & Quincy has ordered 10 combination coaches from the American Car & Foundry Co.

The Pere Marquette has ordered 500 box cars and 500 gondola cars from the American Car & Foundry Co.

The Chicago Refrigerator Car Company is having 100 freight cars built by the Mt. Vernon Car Manufacturing Co.

The Apex Equipment Co., 11 Broadway, New York, is in the market for from 12 to 15 standard gage logging cars.

The Lake Shore & Michigan Southern has ordered 1,000 steel gondolas of 100,000 lbs. capacity from the Pressed Steel Car Co.

The Central of New Jersey has ordered 25 passenger coaches and five combination passenger and baggage cars from the American Car & Foundry Co.

The Central Lard Company, Jersey City, N. J., has ordered 20 tank cars of 80,000 gallons capacity from the American Car & Foundry Co. for Dec. 15, 1904, delivery.

The Chicago, Burlington & Quincy, reported in our issue of October 28 as being in the market for 1,000 box cars of 80,000 lbs. capacity, is said to have let this order to the Pullman Co. The cars will be 40 ft. long, 8 ft. 6 in. wide, and 8 ft. high.

The Chicago & Eastern Illinois, as reported in our issue of November 11, has ordered 550 gondolas from the American Car & Foundry

Co., and 250 gondolas from the Western Steel Car & Foundry Co. The company is also considering the purchase of 200 additional cars.

The Chicago, Rock Island & Pacific, as reported in our issue of November 11, has ordered three postal cars from the Pullman Co. for Dec. 15, 1904, delivery. These cars will be 60 ft. 9 in. long and 10 ft. wide over side sills. Special equipment includes: National-Hollow brake-beams, Westinghouse brakes, Janney couplers, Pintsch light, Standard Coupler Co.'s platforms and National Car Wheel Co.'s wheels.

The Northern Pacific, as reported in our issue of October 28, is in the market for 1,000 gondola cars of 100,000 lbs. capacity. These cars will be 40 ft. long, 9 ft. 3 in. wide, inside measurements; and 8 ft. 4 1/2 in. high, to be built of wood, with metal underframes. The special equipment will include: Improved quick action air-brakes, Caswell drop bottom doors and Miner draft rigging.

The Chicago, Rock Island & Pacific has ordered 1,500 refrigerator cars of 60,000 lbs. capacity from the American Car & Foundry Co., 1,000 box and 500 furniture cars from the Pullman Co., and is considering the purchase of about 1,000 additional freight cars. The refrigerator cars will be 40 ft. long and 9 ft. wide over sills. Special equipment includes: Damascus brake-beams, Miner draft rigging, Hutchins roofs and arch-bar trucks.

The St. Louis & San Francisco, as reported in our issue of November 11, has ordered 1,300 box cars of 60,000 lbs. capacity, 300 furniture cars of 60,000 lbs. capacity, and 300 gondola cars of 100,000 lbs. capacity from the American Car & Foundry Co. The box cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. 2 in. high. The furniture cars will be 40 ft. long, 9 ft. wide and 10 ft. high. The gondolas will be 30 ft. 9 in. long, 8 ft. 9 in. wide, and 6 ft. 2 3/4 in. high.

The El Paso & Southwestern, as reported in our issue of November 11, has ordered 30 side-dump ore cars of 100,000 lbs. capacity from the Pressed Steel Car Co. for November 20 delivery. These cars will weigh 40,000 lbs. and will be 31 ft. 6 in. long, 9 ft. 2 in. wide and 9 ft. high, with steel frames. The cars are divided into four separate compartments with vertical side doors to each compartment operated by air cylinders. Special equipment includes: Pressed Steel bolsters, Westinghouse brakes, Tower couplers, twin-spring draft rigging, Symington journal boxes, Diamond trucks and 700-lb. wheels.

The Lehigh Valley, as reported in our issue of November 11, has ordered 1,000 box cars of 80,000 lbs. capacity, with steel underframes, from the American Car & Foundry Co. These cars will weigh 39,000 lbs., and will be 36 ft. long, 8 ft. 6 1/2 in. wide and 8 ft. 1 1/2 in. high. Special equipment includes: open-hearth steel axles, American Steel Foundries cast-steel bolsters, M. C. B. brake-shoes with Congdon inserts, Westinghouse brakes, Security No. 3 door fastenings, Miner draft rigging, Symington dust guards, journal boxes and journal box lids; Winslow improved roofs, Railway Steel-Spring Co.'s springs, M. C. B. Magnus metal brasses, M. C. B. steel couplers and cast-steel wheels.

BRIDGE BUILDING.

AKRON, OHIO.—Bids are wanted November 30 by the Board of Public Service for building a steel bridge known as the Mill street bridge over the railroad tracks, with a main span of 162 ft. and three spans of 60 ft., estimated to cost \$50,000, and for the superstructure, consisting of about 6,000 yds. of concrete. J. W. Payne is City Engineer.

ALGIERS, LA.—Bids for the viaduct ranged in price from \$56,000 to \$140,000 and have all been rejected, as the lowest bid exceeds the appropriation of \$40,000 by \$16,000. A new location may be decided upon to build a structure within the range of the appropriation. (September 16, p. 93.)

CHARLOTTETOWN, P. E. I.—The combined railroad and highway bridge under construction over the Hillsborough river will not be completed this winter. It will be one of the largest bridges in Eastern Canada, over a mile long, including the abutments and approaches. The piers, which are placed 250 ft. apart, have all been completed. The bridge is being built by the government at a cost of about \$1,500,000. M. J. Haney, of Toronto, is the contractor.

COLUMBUS, GA.—A steel bridge is to be built over Randall creek to replace the present wooden structure in Muscogee county.

CONCORD, OHIO.—The Baltimore & Ohio, it is reported, will build a new overhead bridge here.

BUXTON, ONT.—J. W. Shackleton, C. E., is preparing plans for a new steel bridge with concrete abutments over the Waddick drain.

ELYRIA, OHIO.—The County Commissioners, according to reports, have been petitioned to build a bridge over Black river in Sheffield township at a cost of \$200,000, to replace the present structure.

EVANSVILLE, IND.—The Evansville & Eastern Electric, it is reported, has given a contract to the American Bridge Co., of Lafayette, for two steel spans each 130 ft. long, to be built on the line of its road between this place and Rockport.

GLACE BAY, N. S.—A steel bridge will be constructed over Caledonian brook by the town council. Approximate cost \$20,000.

LUDLOW, MASS.—The Ludlow Manufacturing Associates, of which Mace Moulton, 150 Nassau street, New York, is Consulting Engineer, has given a contract to the United Construction Co., of Albany, N. Y., at its bid of \$21,490 for building a plate girder single-track railroad bridge consisting of three spans each 100 ft. long over the Chicopee river. The other bids were: Boston Bridge Works, \$21,995; Berlin Construction Co., Berlin, Conn., \$22,000; Eastern Bridge & Structural Co., Worcester, Mass., \$22,329; New England Structural Co., Boston, Mass., \$22,500.

MACON, GA.—The City Council, at a recent meeting, decided to instruct the Central of Georgia to build a steel bridge over the tracks at Oglethorpe and Shamrock streets.

MUNFORDVILLE, KY.—A bridge is proposed over Green river at this place to cost about \$40,000, on which a vote was to have been taken recently.

NEW GLASGOW, N. S.—The iron bridge over the East river near this place, a section of which gave way, carrying into the river below a train of the Intercolonial Railway on November 7, will be replaced by a steel structure. W. B. McKenzie, Moncton, N. B., is Chief Engineer.

NEW YORK, N. Y.—Bids are wanted November 29 at the office of the Aqueduct Commissioners for building the superstructure of a highway bridge 200 ft. long over the spillway of the new Croton dam in the town of Cortlandt, Westchester County, N. Y. William H. Ten Eyck is President.

SANDPOINT, IDAHO.—The new steel bridge of the Northern Pacific, which has been under construction for about three years, almost a mile long over an arm of Lake Pend d'Oreille, has been completed and opened for traffic.

SUNBURY, PA.—The Sunbury Bridge Co. has been given a charter to build a bridge over the Susquehanna river from a point near this place to Shamokin Dam, in Snyder county, at a cost of about \$175,000. George W. Drury, of York, Pa., is one of the incorporators. (September 30, p. 110.)

TORONTO, ONT.—The James Bay Railway is preparing plans for a number of bridges on its line between Toronto and Parry Sound. H. J. Wicksteed, Toronto street, Toronto, is Chief Engineer.

WILKESBARRE, PA.—The Grand Jury has favorably reported on the question of build-

ing 39 small bridges costing from \$100 to \$2,000 each and aggregating about \$20,000.

WINNIPEG, MAN.—The city councils of Winnipeg and St. Boniface will jointly build a steel bridge over the Assiniboine river.

Other Structures.

ALEXANDRIA, VA.—Plans are ready for the new passenger station which will be built at the head of King street by the Washington Southern Railroad. It will be of brick with four waiting rooms and a platform about 700 ft. long.

BALTIMORE, MD.—The Baltimore & Ohio has given an order to build about 33 stations at places along the line of its road to replace other structures, the work to be done this winter. The company has also under consideration the question of putting up some larger stations costing from \$50,000 to \$100,000, on which work will probably be begun in the spring.

BANGOR, ME.—Local reports state that the directors of the Maine Central have decided to build a union passenger station at the foot of Exchange street, on which work is to be commenced early next spring.

FORT WORTH, TEX.—The Texas & Pacific, it is reported, will put up car shops at this place.

HOPE, ARK.—The City Council has passed an ordinance permitting the railroads entering this place to jointly build a new passenger station at Front and Vine streets, to cost about \$15,000.

JACKSONVILLE, FLA.—The Atlantic Coast Line, it is reported, has given a contract to William T. Cotter, of this place, for work on its export terminal at a cost of \$100,000, which includes 10 long piers.

LONG BRANCH, N. J.—The Central of New Jersey, according to local reports, has plans ready for a new passenger station to be built this winter to replace the structure recently destroyed by fire.

MONROE, LA.—According to local reports, the Vicksburg, Shreveport & Pacific will build a brick passenger station on Pacific street 163 ft. long to cost about \$40,000. A new brick station to cost a similar amount will also be built by the St. Louis, Iron Mountain & Southern.

NEW ORLEANS, LA.—The St. Louis & San Francisco, according to reports, has approved plans for its terminals here, which include a station and a dock 1,600 ft. long, to accommodate nine vessels at one time, for which bids may soon be asked by J. F. Hinckley, Chief Engineer, St. Louis, Mo. There are to be three concrete walls. The total cost of the improvements will be about \$2,000,000.

The Port Commissioners, local reports state, will pay \$75,000 for building a steel shed, on which work will be commenced as soon as the wharf now building, extending from Conti street to St. Ann, at a cost of about \$100,000, is completed.

NORTH ALBANY, N. Y.—The Delaware & Hudson, according to reports, will build, early next spring, a roundhouse and shops here.

OWOSSO, MICH.—The Grand Trunk, it is reported, is clearing a site on which it will build a new \$35,000 passenger station.

PITTSBURG, PA.—According to local reports, the Pennsylvania Railroad is planning to build the new East Liberty passenger station next spring.

PRINCETON, IND.—The St. Louis & San Francisco, local reports state, is locating a site for new shops.

SHAWNEE, OKLA. T.—The Atchison, Topeka & Santa Fe is building a stone roundhouse with 16 stalls. A number of buildings costing about \$300,000 are about completed and work will soon be started on a stone shop 240 x 115 ft., two stories high,

WASHINGTON, D. C.—On Nov. 10 twenty bids were opened for the new buildings for

the Department of Agriculture, for which the total appropriation available is \$1,500,000. The bids cover the superstructure complete except for mechanical equipment, and range from \$1,225,000 to \$1,400,000.

WESTBROOK, CONN.—Press reports state that the New York, New Haven & Hartford will give a contract for building a new brick station two stories high, 21 x 63 ft., at this place.

WILMINGTON, DEL.—Plans, it is reported, have been submitted by the Pennsylvania to the Building Department for its new office building, which is to be six stories high, of brick and stone, with a steel frame, to cost about \$100,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALCOLU R. R.—Work is now in progress on an extension of this railroad from Gibson, S. C., to Beulah, in Florence County, three miles. The line will probably be opened for traffic by January 1. The road runs at present between Alcolu and Gibson, 20 miles. R. J. Alderman, Alcolu, S. C., is President.

ATLANTA & BIRMINGHAM AIR LINE (SEA-BOARD AIR LINE).—It is announced that this new line from Atlanta, Ga., to Birmingham, Ala., 168 miles, will be completed before the end of the year. The portion between Atlanta and Rockmart, 47 miles, is already in operation and the only work remaining unfinished is the Hardwick Gap tunnel on the section between Coal City and Rockmart. For a description of this line, see our issue of July 1, page 104.

AURORA, DE KALB & ROCKFORD (ELECTRIC).—An officer writes confirming the report that a contract has been let to W. C. Ross, of Aurora, Ill., for building this proposed electric railroad from Aurora north through Maple Park and Cortland to De Kalb, 30 miles. The maximum grade will be 2 per cent. and the entire road will be laid with 70-lb. rails. There will be no important bridges. Theodore Worcester, Aurora, Ill., is President, and R. W. Conant, Chief Engineer. (October 28, p. 139.)

CANADIAN PACIFIC.—It is officially announced that the Arcola branch from Regina to Arcola, 113 miles, will be completed and placed in operation by November 21. (May 27, p. 410.)

CHICAGO & NORTH WESTERN.—This company has incorporated the Wyoming & Northwestern for the purpose of extending its line from Casper, Wyoming, west to the Big Horn river. The incorporators of the new railroad are all officials of the Chicago & North Western. By means of this extension, the North Western will reach the Big Horn basin in Wyoming and the Shoshone reservation, which is to be opened to settlement next spring.

Press reports state that this company is planning to build a branch line from a point near Mercer, Iron County, Wis., in a north-easterly direction to a point on the boundary line between the States of Wisconsin and Michigan, 25 miles; also a branch from a point in Forest County, Wis., to the State line, a distance of 30 miles.

DELAWARE & EASTERN.—This company has been incorporated in New York with an authorized capital of \$600,000. It is proposed to build a steam railroad from Eastbranch, N. Y., to Arkville, with a branch line to Andes, a total distance of about 45 miles. Connection will be made with the Ulster & Delaware at Arkville and with the New York, Ontario & Western at East Branch. Among the directors are: Edward Kelly, of Wharton, N. J.; J. W. Learing, Dover, N. J.; H. A. V. Post, Russell Murray and G. A. Lee, of New York.

DENVER & RIO GRANDE.—A contract has been let to Bell & Levy, Pueblo, Colo., for building a seven-mile extension from the Loma branch northwest to coal fields near Walsenburg. Surveys for this line were completed a short time ago and the grading will be begun at once.

DENVER, WICHITA & MEMPHIS.—A charter has been granted this company in Oklahoma Territory with an authorized capital of \$1,000,000 to build a railroad 1,800 miles long through Colorado, Kansas, Oklahoma Territory, Arkansas and Indian Territory. The names of the incorporators are not stated.

EVANSVILLE & EASTERN (ELECTRIC).—Grading is reported in progress on this electric railroad from Evansville, Ind., to Rockport, 35 miles. It is stated that track laying will be begun early in the spring. An extension is projected to Tell City, Ind., 40 miles. J. C. Haines, Evansville, Ind., is President, and H. A. Genung is Chief Engineer.

GULF, TEXAS & NORTHERN.—The proposed route of this road, which was recently organized in Texas, is from Sabine Pass, Tex., to Oklahoma City, Okla. T., 300 miles. The principal office of the company is at Marshall, Tex., and the authorized capital stock is \$500,000. W. L. Martin, W. C. Pierce, Jr., L. W. Lloyd, A. B. Blocker and others, of Marshall, Tex., are incorporators.

HUMBOLDT NORTHERN.—Incorporation has been granted this company in California with an authorized capital of \$2,500,000. It is proposed to acquire and operate a railroad from Arcata, Cal., to a point near the mouth of the Klamath river, in Del Norte County, 70 miles. Branches will also be built south from Arcata to Fairhaven, 15 miles, and in a westerly direction for a distance of 10 miles. W. Carson, J. M. Carson, A. H. Connick and others are named as incorporators.

ILLINOIS & MISSOURI.—A charter has been granted this company in Illinois. It is proposed to build a railroad from Quincy, in Adams County, Ill., in a southerly direction through Melrose and Fall Creek to East Hannibal, in Pike County, Ill. E. H. Osborn and Lyman McCarl, of Quincy, Ill., are incorporators.

ILLINOIS CENTRAL.—This company is about to remove a portion of its line, which is near the Mississippi river at Wycliff, Ky., away from the river for a distance of about 2½ miles. This was made necessary by the continual washing of the Mississippi river against the railroad tracks. The work, which will involve the removal of 1,500,000 cu. yds. of earth, will be done by W. J. Oliver & Co., Knoxville, Tenn.

KALAMAZOO & LAKE SHORE.—It is reported that money has been secured and that work will be resumed on this road in the early spring. Grading was begun last January, but the work was stopped on account of lack of funds. The proposed route is from Benton Harbor to Kalamazoo, Mich. G. A. Mullins, of Kalamazoo, is interested.

KANAWHA & EASTERN.—A charter has been granted this company in West Virginia to build a railroad from Plymouth, in Putnam County, to the mines of the Alpha Coal Co., three miles from Liguano creek, a distance of 10 miles. The names of the incorporators are not stated. Connection will be made with the Chesapeake & Ohio at Plymouth.

LANSING MANUFACTURERS' RAILROAD.—An officer writes that contracts for building this proposed belt line around the city of Lansing for a distance of six miles will be let in January, 1905. The new line will connect with all the railroads entering the city and with the various manufacturing industries in the outskirts. J. H. Seagar, Houston, Mich., is President. (September 9, p. 87.)

LONG ISLAND.—Vice-President Potter says that the lines which this company is now electrifying aggregate 45 miles, as follows: From Flatbush avenue to Jamaica and Queens, from Hammels to Valley Stream, from Ozone Park to Rockaway Beach, and from Jamaica to the Metropolitan race track. One hundred and twenty-two motor cars, the same as those on the Interborough, have been ordered.

LOUISVILLE & NASHVILLE.—The newspapers say that this company is planning to make important improvements on its line between

Livingston, Ky., and Jellico, Tenn., 62 miles. Surveys for this revision of the line have been in progress for some time, and it is reported that contracts will shortly be let.

MEXICAN ROADS.—The El Oro Mining & Railroad Co., which recently obtained a concession from the Mexican Government for building a railroad from Tultenango to Toluca, 65 miles, will soon place engineers in the field to locate the route of the proposed road.

Governor Emmanuel Guillen, of the State of Guerrero, is said to be interested in a proposition to build a railroad from Chilpancingo to the City of Mexico on the north and to the port of Acapulco on the south. It is stated that surveys for these lines will soon be begun.

The Agostitlan Coal Co., Ltd., is building a narrow-gauge railroad from Irimco on the National of Mexico, to Agostitlan, in the State of Michoacan, a distance of 32 miles. About 20 miles have already been graded.

A concession has been granted by the Mexican Government to Col. J. H. Hampson, of the City of Mexico, to build and operate a railroad from Rancho del Guarda, in the Federal district, to Canada de Nepanepa, in the State of Morelia. The terms of the concession require that surveys shall be begun at once and that the road shall be completed within three years. Mr. Hampson built the Mexico, Cuernavaca & Pacific and operated it for several years.

Press reports state that a syndicate of English capitalists has organized the Culiacan Coast Line for the purpose of building and operating a railroad from Hermosillo, in the State of Sonora, to the Port of Culiacan, in the State of Sinaloa, about 1,200 miles. The general offices of the company will be located at Hermosillo. The road will pass through large timber and mineral regions in the States of Sonora and Sinaloa.

MISSOURI, OKLAHOMA & GULF.—This company, which was recently organized in Oklahoma Territory, proposes to build a railroad from a point on the northeastern boundary of Indian Territory southeast through Indian Territory to the junction of the Washita and Red rivers on the Texas State line, with a branch from Henrietta, Ind. T., to Shawnee, Okla. T., a total distance of about 375 miles. William Kennesick, Kansas City, Mo.; W. A. Dewar, Muskogee, Ind. T.; J. McNeal, Guthrie, Okla. T., and others are incorporators. (November 4, p. 147.)

MONONGAHELA & WASHINGTON.—Press reports state that surveys are now being made for an extension of this road from a point near Ellsworth, Pa., south to a point in West Bethlehem township to reach the lands of the Pittsburg & Buffalo Coal Co., a distance of 16 miles.

NATIONAL OF MEXICO.—The opening of the Matamoros branch has been delayed on account of heavy rains and floods in that part of Mexico through which it will run. It is stated that it will probably be January before the line is finished and put in operation between Monterey and Matamoros. (July 15, p. 35.)

NEVADA SOUTHERN.—This company has been organized in Nevada to build an extension of the Tonopah Railroad from Tonopah, Nev., to Goldfields, 28 miles. R. W. Welsh, Tonopah, Nev., is Chief Engineer.

NEW YORK, NEW HAVEN & HARTFORD.—Press reports state that work is progressing rapidly on the double tracking of the line between New Haven and Poughkeepsie. Second track has already been laid from Hopeville Junction to Stormville, five miles, and grading is now in progress between Stormville and Towners, 15 miles. It is the intention of the company to build a second track between Danbury and Hawleyville and ultimately to New Haven.

NEW YORK SHORT LINE (PHILADELPHIA & READING).—Contracts have been let for the grading and masonry on section 2 of the New York Short Line to the B. M. & J. F. Shanley Co., Philadelphia, and for the grading and masonry for additional tracks on the Philadelphia, Newtown & New York

branch to Ryan & Kelley, also of Philadelphia. The entire line is now under contract, as the work on sections 1 and 3 was let to the Millard & McGraw Construction Co. and the E. E. Smith Construction Co., both of Philadelphia, some time ago. Section 2 extends from a point about 500 ft. east of the crossing of the Krewstown road to about 450 ft. west of the Southampton road, a distance of about two miles. The contract let on the Newtown division takes in that part of the road between Logan and Crescentville, 2.1 miles. (July 29, p. 47.)

NORFOLK & WESTERN.—A contract has been let to W. J. Oliver & Co., of Knoxville, Tenn., for building an extension of the larger & Southern branch of this railroad in West Virginia. A few miles of this branch are already completed from Iager, W. Va., south to Ritter, and it is proposed to build a further extension from Ritter to Jacobs Fork, 57 miles.

NORTHERN MAINE SEAPORT RAILROAD.—This company has been granted a charter to build a railroad from La Grange, on the Bangor & Aroostook, to a connection with the Maine Central at Belfast, with branch lines to Stockton Springs and Searspoint, a total distance of about 60 miles. Surveys will be begun at once. F. W. Cram, Bangor, Me., President of the Bangor & Aroostook, is one of the incorporators.

NORTHERN PACIFIC.—Press reports state that plans have been completed for lowering the tracks of the Northern Pacific through Spokane, Wash. The estimated cost is said to be \$2,000,000. E. J. Pearson, St. Paul, Minn., is Chief Engineer.

OREGON ROADS.—The Grand Ronde Lumber Co., La Grande, Ore., has completed surveys for a narrow-gauge logging railroad from Hilgard, eight miles from La Grande, up the Grand Ronde river to Perry, in the Blue Mountains, a distance of 30 miles. Work is to be begun at once.

PHILADELPHIA, BALTIMORE & WASHINGTON.—A contract has been let to C. A. Sims & Co., of Philadelphia, for grading, track laying and masonry work from Principio, west to the Susquehanna river, 2.5 miles, and from the Susquehanna river west to Oakington, Md., three miles. This work is in connection with the change of line necessary to reach the new bridge to be built over the Susquehanna river.

PRINCE EDWARD ISLAND.—The contract for building the branch line from Village Green to the Vernon river bridge, 4½ miles, has been let to Schurman, Morrison & Mitch, of Charlottetown, P. E. I. The contract for the branch line from Cardigan to Montague bridge, 6.3 miles, has been let to Willard Kitchen, of Fredericton, N. B. (October 14, p. 125.)

RIO GRANDE, SIERRA MADRE & PACIFIC.—The newspapers say that W. G. Greene, who recently purchased this railroad, will apply to the Mexican Government for a concession to extend the road from Terrazas to the port of Guaymas on the Gulf of California. This proposed extension will run through the Yaqui Indian country and will traverse the San Marcial coal fields in the State of Sonora.

SAN PEDRO, LOS ANGELES & SALT LAKE.—A contract has been let to the Utah Construction Co. for widening the embankment to 18 ft. at the top, on that portion of the line recently acquired by the Oregon Short Line between Lynn Junction, Nev., and Caliente. The construction company will also build 3,000-ft. sidings every three miles on this part of the line. Track has been laid as far as 127 miles southwest of Caliente, and the remaining portion of the line to be completed is only 75 miles, of which about 90 per cent. has already been graded.

TENNESSEE CENTRAL.—A contract has been let to W. J. Oliver & Co., of Knoxville, Tenn., for building a branch line from Ozone, Tenn., along Fall creek to the coal fields of the Tennessee Coal & Lumber Co., four miles. Work is to be begun at once.

UINTAH RAILROAD.—This road has been finished between Mack, Colo., and Dragon, Utah, 50 miles. Surveys are now in progress for an extension from Dragon west to Vernal, 10 miles. A. M. Johnson, Mack, Colo., is Chief Engineer, and H. H. Dunham, Equitable building, Denver, Colo., is President. (October 21, p. 133.)

WESTERN PACIFIC.—According to newspaper reports, a contract has been let to M. J. Henry, of Seattle, Wash., for grading part of this proposed line between San Francisco, Cal., and Salt Lake City, Utah. H. H. Yard has been in charge of the surveys. W. J. Barnett, San Francisco, Cal., is President. (April 15, p. 298.)

RAILROAD CORPORATION NEWS.

ATCHISON, TOPEKA & SANTA FE.—President E. P. Ripley is quoted as saying that J. D. Rockefeller and James Stillman, President of the National City Bank, of New York, have purchased \$25,000,000 of Santa Fe stock. Mr. Ripley says that he believes this stock was bought as an investment and not with the idea of obtaining control.

ATLANTIC COAST LINE.—This company has announced extra dividends of 20 per cent. in stock scrip and 5 per cent. in certificates of indebtedness to its shareholders.

CANADIAN PACIFIC.—A circular has been sent to the stockholders of this company offering to shareholders of record October 27 the right to subscribe to \$16,900,000 common stock at par to the extent of 20 per cent. of their present holdings. Stockholders may pay any or all of the installments in advance, but no interest will be allowed on advance payments. All new stock, whether installments have been paid in advance or only on the regular payment dates, will rank for the full dividend accruing for the half year ending June 30, 1905.

CHICAGO, ROCK ISLAND & PACIFIC.—It has been officially announced that this company has sold to Speyer & Co., New York, \$25,000,000 first refunding mortgage 4 per cent. bonds. These are part of the issue of \$163,000,000 bonds authorized about a year ago. When this issue was originally authorized, it was intended to issue \$15,000,000 of the bonds at once; but, owing to the stock market conditions prevailing at that time, the company raised money for its immediate requirements by issuing notes. It is expected that the proceeds from the sale of these new bonds will be used to retire these notes and to refund the \$6,500,000 first-mortgage 5 per cent. bonds of the Burlington, Cedar Rapids & Northern, which mature in 1906. No detailed statement of the purposes of the present issue has as yet been given out. The bonds are the direct obligation of the Chicago, Rock Island & Pacific Railway Co., and are redeemable at 105 and accrued interest on or before April 1, 1911, on 60 days' notice.

CINCINNATI, HAMILTON & DAYTON.—It seems to be generally understood that the Erie, through the banking houses of H. B. Hollins & Co. and J. P. Morgan & Co., has secured an option on a controlling interest in the C., H. & D. and the Pere Marquette, but no authoritative statement has been made.

COAL RIVER & WESTERN.—Senator W. C. Sproul, of Chester, Pa., has bought one-half interest in this railroad, which runs from St. Albans, W. Va., up the Coal river to Briar Creek, 25 miles. Mr. Sproul proposes to extend the line up Little Coal river to Cobb's Creek, where he owns 13,000 acres of coal lands.

COLORADO & SOUTHERN.—G. H. Walter & Co., St. Louis, are offering for sale \$250,000 of the outstanding issue of \$1,395,000 car trust 5 per cent. bonds dated June 1, 1904. These bonds are secured by a mortgage on 2,700 freight cars, on which cash pay-

ments amounting to \$840,000 have already been made. The interest on the bonds is payable quarterly beginning June 1, 1904.

ERIE.—See Cincinnati, Hamilton & Dayton.

GRAND TRUNK PACIFIC.—This company has secured an option on the Pacific Northern & Omineca, which runs from Ritimat to Hazelton, in British Columbia, 135 miles.

GRAND TRUNK.—The report of this company for the half year ending June 30, 1904, shows gross receipts of \$12,796,579, as against \$13,890,400 for the first half of last year, a decrease of \$1,093,895. After deducting \$9,477,845 for operating expenses, net earnings were \$3,318,735, as compared with \$3,915,245 in the first half of 1903. The large decrease in gross receipts was due to a heavy falling off in freight and live stock traffic, earnings from this source being \$1,202,495 less than in the first six months of 1903. This loss is attributed by the management to the unprecedented severity of the winter during the first three months of 1904. Changes in line during the year include second track work and grade revisions on the main line between Whitby and Port Hope, which now make a continuous second track between St. Johns, Montreal, Hamilton and Niagara Falls, a distance of 442 miles. The statistics of operation for the half year follow.

| | 1904. | 1903. |
|------------------------|---------------|---------------|
| Av'ge mileage worked | 3,562 | 3,555 |
| Passenger train-miles. | 3,774,258 | 3,570,809 |
| Passengers carried .. | 3,957,814 | 3,960,494 |
| Freight train-miles .. | 4,733,697 | 5,678,746 |
| Tons carried | 5,927,904 | 6,745,854 |
| Ton-miles | 1,129,081,776 | 1,426,228,689 |

MEXICAN RAILWAY.—The report of this company for the half year ending June 30, 1904, shows gross receipts of \$3,150,387, a gain of \$422,884 over the corresponding period in 1903. Of this increase, \$139,625 was from home freight traffic, \$218,843 from foreign freight traffic, and \$64,416 from passenger traffic. Operating expenses increased only \$21,706, leaving a gain in net earnings for the six months of \$401,178. After payment of all fixed charges, there was a balance of \$384,375, which is equal to a trifle over 6 per cent. per annum on the first preferred stock.

NEW YORK, ONTARIO & WESTERN.—At a special meeting of the stockholders on November 9, an issue of \$12,000,000 50-year 4½ per cent. gold bonds was authorized. This issue was proposed by President Fowler at the regular meeting in September. Of these bonds, \$2,000,000 will be issued at once and the proceeds will be used to pay for improvements.

TOLEDO, ST. LOUIS & WESTERN.—Gross earnings of this company for the last fiscal year were \$3,341,648, an increase of \$230,290. Of this gain, \$192,049 was derived from freight and \$32,928 from passengers. Operating expenses for the year were \$2,426,174, an increase of \$169,198. Over 90 per cent. of this was due to an increase in charges against conducting transportation amounting to \$159,242. Net earnings were \$797,124, a gain of \$59,742, and the surplus was \$543,829, as against \$309,885 on June 30, 1903. During the year, securities amounting to \$543,400 were added to the funds in the treasury, being composed of \$238,000 prior lien bonds issued on account of improvements, and \$305,400 of bonds and stocks received from a favorable settlement of litigation.

VANDALIA.—Plans are now being formulated by the Pennsylvania interests for the complete reorganization of the Vandalia Lines recently sold under foreclosure proceedings. A new company will probably be formed to operate all the lines, which consist of the Terre Haute & Indianapolis; St. Louis, Vandalia & Logansport; Indianapolis & Vincennes, and the Logansport & Toledo. The Terre Haute & Peoria, now a part of the Vandalia System, will not be merged in the new company, but will be operated under lease as heretofore.



ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY BY
THE RAILROAD GAZETTE
At 83 Fulton St., New York.

EDITORIAL ANNOUNCEMENTS:

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages and all of the advertisement pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name, Transport and Railroad Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.

FRIDAY, NOVEMBER 18, 1904.

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